

THE EFFECT OF INITIAL PUBLIC OFFERING (IPO) FIRM  
LEGITIMACY ON COOPERATIVE AGREEMENTS  
AND PERFORMANCE

by

TIMOTHY SCOTT REED

B.S., University of Florida, 1985  
M.S., Central Michigan University, 1990

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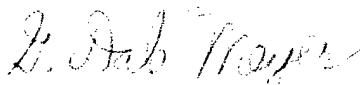
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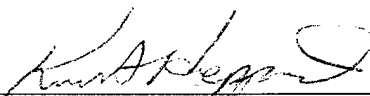
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The Effect of Initial Public Offering (IPO) Firm  
Legitimacy on Cooperative Agreements and Performance  
Thesis directed by Professor G. Dale Meyer

This dissertation examines firm legitimacy at the time of a firm's initial public stock offering (IPO) and its impact on the quantity and quality of cooperative agreements post-IPO. Firm legitimacy is operationalized at the time of IPO as a combination of total firm value, number of employees, firm age, market-to-book ratio, and percentage of ownership maintained by the original owners. The dissertation finds that firm value, market-to-book ratio, and firm age are positively related to an increase in the quantity of cooperative agreements while only the value of the firm at time of IPO is positively related to the quality of cooperative agreements post-IPO. The dissertation also finds that increased use of cooperative agreements in the post-IPO environment does not positively affect firm performance. Firm performance is operationalized as changes in stock price, sales growth, and return on investment (ROI). A negative relationship is found to exist between increased cooperative agreements and firm ROI. These results are important because they provide some initial insights into which variables typically associated with firm legitimacy have the greatest association with the quantity and quality of cooperative agreements established by firms at the critical time of their initial public stock offerings and subsequent firm performance.

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DEDICATION

*For my Dad.*

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Sparky Anderson said on the occasion of his election to the Major League Baseball Hall of Fame "You don't earn honors like this, you are guided toward them through the aid and assistance of others." While this dissertation pales in comparison to the accomplishment he was speaking of, I agree completely that without the help of others this dissertation would never have been completed. The list of those that have helped along the way is long--family, friends, colleagues--you know who you are--I thank you for your friendship and assistance.

I would like to acknowledge the extraordinary assistance of several people I received along the way. My parents provided me with the inspiration to never ever stop learning. John Meacham (1983: 120) said everything appears simple from the distance of ignorance. "The more we learn about (something), the greater the number of uncertainties, doubts, questions, and complexities." Wisdom is knowing that the more you learn, the more you find you don't know. I'm not sure if my parents read Meacham, but they instilled the essence of his message in me.

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## CHAPTER I

### INTRODUCTION AND OVERVIEW

*"No company can go it alone."*

The observation above (Doz and Hammel, 1998: ix) sums up the numerous comments, thoughts, observations and conclusions in the ever increasing stream of research on cooperative agreements.<sup>1</sup> The fact that inter-firm cooperation as a vehicle for firm success is discussed so ubiquitously underscores its importance to management scholars. Utilization of cooperative strategies has been seen to be the answer for firms seeking to enter new markets (Kogut, 1988), to compete globally (Hitt & Tyler, 1995; Dacin & Hitt, 1997; Hitt & Dacin, 1998), to increase firm learning and knowledge (Meyer & Alvarez, 1997; Alvarez, 1999), and to boost research and development (Ring & Van de Ven, 1992). This non-

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<sup>1</sup> For this dissertation cooperative agreements include joint ventures, equity joint ventures; natural research exploration, funding agreements, royalty alliances, licensing agreements, exclusive licensing agreements, joint manufacturing operations, joint marketing operations, original equipment manufacturing/value added reseller agreements, privatization government alliances, joint research & development, supply agreements, and firm spinouts.

exhaustive list illustrates some of the examples of the potential positive benefits of cooperation among firms.

One particular type of firm that is believed to be a prime candidate for cooperative agreements is the young, growth oriented firm (Doz and Hamel, 1998). These firms find that a disproportionate number and type of key resources lie outside firm boundaries, and therefore pursue cooperative agreements in order to attain such resources. These young, growth oriented firms often conduct Initial Public Offerings (IPOs) of common stock.

The present research investigates specific relationships between firms that conduct IPOs and the cooperative agreements that follow the IPO event. Specifically, I ask: are there identifiable indicators of firm legitimacy at the time of the IPO that predict an increase in the number and quality of cooperative agreements post-IPO? Further, does an increase in the number and quality of cooperative agreements post-IPO lead to increased firm performance?

#### Initial Public Offerings

The firms sampled in this dissertation all completed IPOs in 1993. This allows the tracking of firm

performance over a five year period following IPO. The primary reason for issuing common shares of stock (or "going public") is to secure the necessary funds to continue firm growth (Jenkinson & Ljungqvist, 1996). As emerging firms grow, they outstrip the capital resources available from the founders and other close sources, and must turn to the market for additional funding. An IPO is the method of initial entry into the financial market system. The resulting public ownership of the firm results in increased liquidity, lowers future capital costs, and enhances strategic flexibility of the firm (Klemm, 1995). It also brings with it a continuous cycle of regulation, oversight, disclosure, financial statements, and firm visibility (Jenkinson & Ljungqvist, 1996).

It is unlikely the firm will ever experience visibility and oversight as intense as that of the IPO period. The requirements of the Securities and Exchange Commission (SEC), investment banks, underwriters, brokerage houses, auditors, and investors are exacting (Chen, 1996; Firth & Liao-Tan, 1998; Hare, 1994; Klemm, 1995; Matsuda, Vanderwerf, & Scarbrough, 1994; Michaely & Shaw, 1995).



### Why IPO Firms?

I have selected IPO firms as the sample for this study for three reasons. First, the intensity of the regulatory inspection of the firm prior to the IPO creates a high visibility environment for IPO firms. As shall be discussed later, the perception one holds of an individual or organization is based on one's incidence and intensity of exposure to the person or organization. It follows that, since the attention on public firms is at its peak at the time of IPO, that any link between firm legitimacy and subsequent inter-firm agreements will be most easily detected at the time of IPO and immediately following IPO. Second, the public disclosure and required filing of financial documents at the time of the IPO offers a unique opportunity for researchers to gather data on firm characteristics. These documents provide highly detailed and carefully audited information about IPO firms. Finally, the preponderance of research on IPO firms to date has focused on the relationship between firm characteristics and outcomes up to the time of the IPO. Very little entrepreneurship or strategy research has investigated the relationship between

legitimacy characteristics and outcomes post-IPO. I hope to address this gap in the literature in this dissertation.

### Dissertation Model and Research Questions

The theoretical foundations of this dissertation are organizational legitimacy and cooperation. Legitimacy researchers have found that organizations must fit within the required parameters of their environment if they are to survive. While the notion of required fit is common throughout the study of legitimacy, scholars differ on their views of the role strategic choice plays in enacting the environment. As I shall discuss in Chapter II, I follow literature that posits a role for firm managers in 1) changing the firm to facilitate fit, and 2) enacting the environment to change requirements for firm acceptance. I utilize these organizational perspectives of firm legitimacy in order to predict variability in quality and quantity of cooperative agreements.

The dissertation also uses the perspectives of cooperation as they relate to firm performance. Extant literature shows that developing theories of cooperation

focus on acquiring resources that organizations would otherwise not have access to or would find cost prohibitive (Buckley & Casson, 1988; Combs & Ketchen, 1999; Golden & Dollinger, 1993; Khanna, Gulati, & Nohria, 1998; Mowery, Oxley, & Silverman, 1998; Skrabec, 1999). I follow the theoretical and empirical findings of the cooperation literature to study the relationship between increases in the use of cooperative agreements and subsequent firm performance.

The dissertation is based on the model shown in Figure 1.

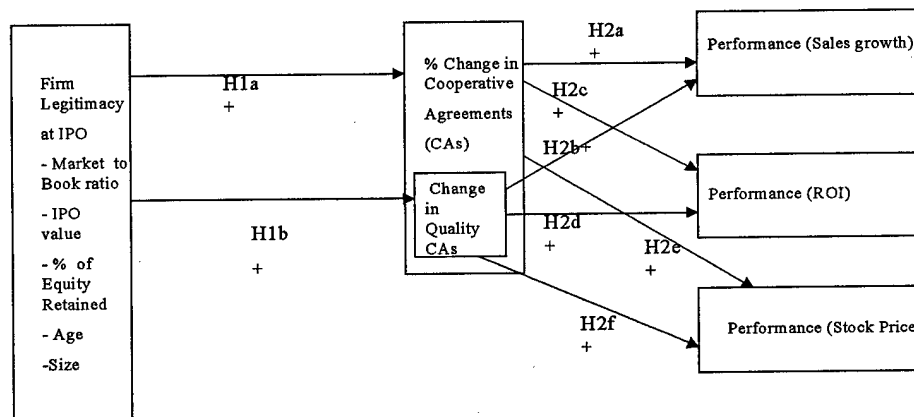


Figure 1

### Dissertation Model

While the variables and hypotheses are discussed in significant detail in the chapters that follow, a brief introduction of the model is useful at this point. The model begins by depicting proposed indicators of firm legitimacy. These indicators have been found to be signals of firm quality and capability in finance and entrepreneurship literature (Clarkson, Dontoh, Richardson, & Sefcik, 1991; Clarkson, Dontoh, Richardson, & Sefcik, 1992; Courteau, 1995; Deeds & Hill, 1999; Keasey & McGuinness, 1992; Keloharju & Kulp, 1996). I hypothesize that these indicators signal the legitimacy of the firm to prospective partners. My argument is that positive perceptions of legitimacy increase the potential for cooperative agreements between the larger firm and

the IPO firm. This first specific question addressed in this study concerns the relationship between these legitimacy factors and ensuing cooperative agreements.

*Is there a relationship between firm legitimacy at the time of IPO and the number of cooperative agreements a firm enters into post-IPO?*

In addition to the quantity of cooperative agreements a firm enters into, the quality of those cooperative agreements is also addressed in this dissertation. The entrepreneurship literature indicates that smaller, younger firms lack key resources that are required to fuel growth (Aldrich & Fiol, 1994; Bruderl & Schussler, 1990; Freeman, Carroll, & Hannan, 1983; Henderson, 1999; Krackhardt, 1996; Singh, Tucker, & House, 1986). Larger firms have the financial and human resources to enter into cooperative agreements, and also to support resource requirements as the agreement progresses. In this study, Fortune 500 companies represent quality collaboration partners. The argument is that these firms have superior environmental scanning resources, and the luxury of picking and choosing high potential smaller partners with which they enter into

agreements. This proposition is reflected in the following research question.

*Is there a relationship between firm legitimacy at the time of IPO and the number of quality cooperative agreements a firm enters into post-IPO?*

There is extensive research enumerating the many ways in which a cooperative agreement can increase firm performance (e.g. Borys & Jemison, 1989; Buckley & Casson, 1988; Hagedoorn, 1993; Hagedoorn, 1995a; Hagedoorn, 1995b; Harrigan, 1988; Hennart, 1988; Kogut, 1988; Meyer & Alvarez, 1997; Meyer & Alvarez, 1998; Nohria & Garcia-Pont, 1991; Osborn & Baughn, 1990; Pisano, 1990; Ring & Van De Ven, 1992; Riordan & Williamson, 1985). Appropriate measures of firm performance vary depending upon the perspective utilized to focus on types of performance. In this study the perspective is that increases in quantity and quality of cooperative agreements increase firm financial performance of stock values, sales growth, and return on investment. This proposed relationship leads to the final set of research questions.

*Is there a relationship between increases in the **number** of cooperative agreements (post-IPO) and firm performance?*

*Is there a relationship between increases in the number of **quality** cooperative agreements (post-IPO) and firm performance?*

## DISSERTATION OUTLINE

In order to effectively present the theoretical development, methodology, results, and conclusions of this study of firm legitimacy, cooperative agreements and firm performance, the dissertation is organized into six chapters.

### Chapter I: Introduction and Overview

In this chapter, an overview of the dissertation is provided as well as the research questions and the model depicting the hypothesized relationships between the study variables. An outline of the six dissertation chapters is also presented.

## Chapter II: Firm Legitimacy and Cooperative Agreements

Chapter II provides a review of the literature on the proposed antecedent of increased numbers and quality of cooperative agreements—firm legitimacy. An overview of differing views on firm legitimacy is presented, including the institutional and strategic perspectives.

The chapter also provides the foundation for the relationship between cooperative agreements and firm performance. Cooperative agreements are viewed as a means to not only attain firm resources, but also overcome barriers to resource availability as well as to secure resources in the most efficient manner possible.

## Chapter III: Theoretical Development of Research

### Hypotheses

Chapter III provides an in depth theoretical development of the dissertation model by deriving research hypotheses from the broad research questions introduced in Chapter I. It develops the links between the three major constructs of legitimacy, cooperative agreements and performance. The expected relationship between firm legitimacy at the time of IPO and subsequent increases in quantity and quality of cooperative



agreements is described. The chapter continues by developing specific hypotheses outlining the expected relationships between increases in cooperative agreements and firm performance.

#### Chapter IV: Research Design and Methodology

Chapter IV provides a detailed explanation of the research design and methodology used to test the hypotheses developed in Chapter III. It begins by describing the variables used in the study, reviews the data sources employed, and presents complete details on required tests of mediation for the change in cooperative agreement variables.

#### Chapter V: Data Analysis and Results

Chapter V reports the results of the data analysis and states the empirical findings for each hypothesis in Chapter III. The chapter begins by describing necessary adjustments to research hypotheses based on preliminary testing for mediation effects. The statistical design then discusses the statistical tests used to examine the

hypotheses and systematically reports the findings for each hypothesis.

#### Chapter VI: Results and Future Research Issues

Chapter VI presents the most important findings of this research project and discusses their impact on theory and practice. Suggestions for extending this research to foreign firms and specific types of inter-organizational forms, as well as continued longitudinal study of IPO firms are made.

## CHAPTER II

### ORGANIZATIONAL LEGITIMACY, COOPERATIVE AGREEMENTS, AND PERFORMANCE

#### INTRODUCTION

This chapter reviews the diverse literature on legitimacy and cooperative agreements. Because extant research on both legitimacy and cooperation encompasses many different perspectives and units of analysis, each review begins with a short macro-level introduction and then focuses on the specific portion of each body of research that is pertinent to my research.

Initially, this chapter discusses differing units of analysis in legitimacy research, provides a useful framework of legitimacy perspectives, then defines and reviews literature relevant to organizational legitimacy. A review of the two major levels of organizational legitimacy (conforming and evaluative) follows. The chapter continues with a discussion of means of acquiring legitimacy (the process of legitimation) and the factors that play key roles in the process. Finally, I argue

that IPO firms may be differentiated based on indicators of legitimacy: age, size, retention of stock shares by owners, market to book ratio, and the total value of the IPO.

The second major body of literature reviewed in this chapter is on cooperative agreements. First, cooperative strategies are defined and the theoretical reasons for pursuing cooperative inter-firm agreements are discussed. Next, theory on the act of resource exchange, which is central to cooperation, is presented. Finally, differing perspectives on the decision to cooperate are discussed.

### **LEGITIMACY**

Traditionally, researchers have examined legitimacy at two levels: (1) at the level of classes of organizations (Carroll & Hannan, 1989; Hannan & Freeman, 1977; Meyer & Rowan, 1977; Singh, Tucker, & House, 1986) and (2) at the individual organizational level (Ashforth & Gibbs, 1990; Covalleski & Dirsmith, 1988; Deephouse, 1996; Dowling & Pfeffer, 1975; Neilsen & Rao, 1987; Ritti & Silver, 1986; Suchman, 1995). In this dissertation, the unit of analysis is the firm, and I examine legitimacy at the level of the individual organization.

Research on organizational legitimacy (e.g. D'Aunno, Sutton, & Price, 1991; Dowling & Pfeffer, 1975; Meyer & Scott, 1983; Scott, 1987, 1995) provides the theoretical foundation on which to examine the questions put forth in Chapter I. Are there relationships between firm legitimacy at the time of the IPO and the number and quality of cooperative agreements a firm enters into after the IPO? Since legitimacy is so fundamental to answering the foregoing research questions, it is necessary to clearly understand the different schools of thought on legitimacy. Scott (1995) developed a useful typology of legitimacy perspectives, which is summarized in the next section.

### Three pillars of legitimacy

A review of institutional theory (Meyer & Rowan, 1977; Scott, 1995; Zucker, 1983) suggests a set of institutional domains that Scott (1995:35) called "pillars of legitimacy" which are delineated as regulatory, cognitive, and normative.

The regulatory pillar is composed of regulatory institutions-that is, the rules and laws that exist to ensure stability and order in societies (North, 1990; Streek & Schmitter, 1985; Williamson, 1975, 1991).

Organizations have to comply with the explicitly stated requirements of the regulatory system to be legitimate. Researchers who utilize the regulative perspective posit that organizations do what they do because they are required to.

The cognitive pillar draws from social psychology (Berger & Luckman, 1967) and the cognitive school of institutional theory (Meyer & Rowan, 1977; Zucker, 1983). Organizations have to conform to or be consistent with established cognitive structures in society to be legitimate. In other words, what is legitimate is what has a "taken for granted" status (Aldrich & Fiol, 1994; Suchman, 1995) in society. A *firm* must look like and act like a *firm* in order to receive cognitive legitimacy. Scholars using the cognitive perspective believe that organizations do things "because all the other organizations do it." Examples of taken for granted indicators of legitimacy might include being incorporated, compiling financial reports, hiring particular types of employees.

The normative pillar goes beyond regulatory rules and cognitive structures to the domain of social values (Selznick, 1957). Organizational legitimacy, in this

view, accrues from congruence between the values pursued by the organization and wider societal values (Parsons, 1960). It is "the degree of cultural support for an organization," which, presumably, will result from such congruence in values (Meyer & Scott, 1983: 201).

Researchers from the normative school focus on the goals of the firm (the ends) and their values (e.g. business practices) used by the firm to meet those goals (the means). For example, an accepted goal may be to win the game. An unacceptable value or goal, however, may be to cheat in order to win. Normative legitimacy results when both goals and values are acceptable to environmental constituents.

While some scholars may emphasize one pillar over another in their work, the pillars are not necessarily mutually exclusive (Scott, 1995). Take for example the act of paying corporate taxes. A firm may chose to pay taxes because it is the law (regulative), because it is expected by the public (normative), and/or because all the other firms do it (cognitive).

Legitimacy from the regulative perspective is dichotomous—either you are in compliance or you are not. If firms do not conform to applicable laws and

requirements, they are not legitimate. Cognitive and normative views of legitimacy are less clear cut. While there may be a minimally accepted level of cognitive and normative behavior, there are certainly higher levels that may be pursued. For example, a firm may adhere to minimum clean air standards (regulative legitimacy). The firm may exceed the standards because all other firms in the area exceed the standards (cognitive legitimacy). Alternatively, the company may exceed the standards while other firms do not due to a organizational culture of environmental protection (normative legitimacy). As the clean air example illustrates, firms may gain legitimacy by meeting, or conforming to minimum standards, or they may gain higher levels of legitimacy by exceeding the minimum standards.

The three pillars of legitimacy provide a useful foundation for discussing conforming versus superordinate legitimacy as well as different constituents in an environment capable of conferring organizational legitimacy.



## ORGANIZATIONAL LEGITIMACY

Scholars have defined organizational legitimacy as the acceptance of the organization by actors in its environment and have proposed it to be vital for organizational survival and success (Dowling & Pfeffer, 1975; Hannan & Freeman, 1977; Meyer & Rowan, 1977).

### Conforming Legitimacy

Early work on organizational legitimacy described it as an evaluative process, gave legitimacy a hierarchical, explicitly evaluative cast, "legitimation is the process whereby an organization justifies to a peer or superordinate system its right to exist" (Maurer 1971: 361). Pfeffer and his colleagues (Dowling & Pfeffer, 1975; Pfeffer, 1981; Pfeffer & Salancik, 1978) retained this emphasis on evaluation, but highlighted cultural conformity rather than overt self-justification. In this view, legitimacy results from agreement between the values associated with or implied by what the organization is and does and the norms of acceptable behavior in the larger social system (Dowling & Pfeffer, 1975).

Meyer and Scott (1983a; Scott, 1991) also depicted legitimacy as stemming from congruence between the organization and its cultural environment; however, these authors focused more on the cognitive than the evaluative dimension. Organizations are legitimate when they are understandable, rather than when they are desirable. "Organizational legitimacy refers to the extent to which the array of established cultural accounts provide explanations for [an organization's] existence" (Meyer & Scott, 1983b: 201). Thus a superordinate evaluative explanation of legitimacy establishes an organization's value in society.

#### Superordinate Legitimacy

While the legitimacy attained through conforming is required for membership in a larger group of firms (e.g. acceptance in an industry) evaluative legitimacy is vitally important in the formation of cooperative agreements. Conforming legitimacy can be conferred on any firm which meets the minimum standards of the social and environmental element in question. Legitimacy stemming from superordinate (leader) standing, on the

other hand, demands that firms meet a higher approval standard. Consider the case of a young firm just completing an IPO. The firm has had a degree of legitimacy bestowed upon it by meeting the requirements of the Securities and Exchange Commission (SEC). Yet all firms that complete an IPO meet the same minimum standards and have the same degree of conformance legitimacy. They have attained membership in the group of publicly traded firms. This characteristic alone however does not provide enough information to the potential large cooperation partner firm. Given a group of potential firms with which to form a cooperative agreement, *ceteris parabus*, it is likely that the large selecting partner will chose the firm with the highest degree of evaluative legitimacy. In other words, such a highly evaluated firm brings added value beyond simple conformity.

Institutions of higher learning serve as useful examples of the difference between conforming and superordinate legitimacy. Colleges and Universities all must meet some minimal standards set by an accrediting body. The school must continue to conform to these

minimum standards in order to maintain its membership in the post-secondary educational institutional group.

Yet these institutions often seek legitimacy above and beyond the minimal levels of the group. Consider the reputational rankings of business schools published by U.S. News and World Report. Universities seek out the specific criteria against which they will be evaluated and strive to maximize their performance in those specific areas. The schools that score the highest in the measured categories are awarded superordinate legitimacy by being ranked in the upper percentiles of like institutions.

The importance of the magazine editors, writers and researchers in the previous example is the focus of a stream of organizational legitimacy research investigating environmental constituents or social actors (Ashforth & Gibbs, 1990; Pfeffer & Salancik, 1978). From the perspective of a particular social actor, a legitimate organization is one whose values and actions are congruent with that social actor's values and expectations for action (Galaskiewicz, 1985; Pfeffer & Salancik, 1978). The social actor accepts or endorses the organization's means and ends as valid, reasonable,

and rational (Ashforth & Gibbs, 1990; Baum & Oliver, 1991; Meyer & Scott, 1983; Singh, Tucker, & House, 1986; Stinchcombe, 1968). Differing roles of social actors in the legitimation process are discussed in the following section.

### Determinants of Organizational Legitimacy and Legitimation

Institutional theorists have identified some of the determinants of organizational legitimacy and the characteristics of the legitimation process (Meyer & Rowan, 1977; Powell & DiMaggio, 1991; Scott, 1995; Selznick, 1957; Zucker, 1983). Three sets of factors that shape organizational legitimacy have resulted: (1) the environment's institutional characteristics, (2) the organization's characteristics, and (3) the legitimation process by which the environment builds its perceptions of the organization (Hybels, 1995; Maurer, 1971).

As indicated in the previous section, firms can conform by meeting minimum standards of the larger group, or attain a greater degree of legitimacy by exceeding those minimums. This increased level of legitimacy is

assessed by the social actors concerned with the legitimacy of the firm in question. The key role played by social actors in the legitimation process leaves us with an important question: Do firm leaders enact the environment to gain legitimacy—or does the environment bestow legitimacy on firms?

### Strategic Versus Institutional Views of Legitimacy

Studies of legitimacy seem increasingly divided into two distinct groups—the strategic and the institutional—that often operate at cross-purposes. Work in the strategic tradition (e.g., Ashforth & Gibbs, 1990; Dowling & Pfeffer, 1975; Pfeffer, 1981; Pfeffer & Salancik, 1978) adopts a managerial perspective and emphasizes the ways in which organizations instrumentally manipulate the environment in order to garner societal support.

Mintzberg (1998) argues that the ability to enact the environment through strategic choice is the defining characteristic of the field of strategic management. Oliver (1991) posited a range of strategic tactics for

engaging the environment ranging from acquiescence to manipulation.

In contrast, work in the institutional tradition (e.g., DiMaggio & Powell, 1983; Meyer & Rowan, 1991; Meyer & Scott, 1983a; Powell & DiMaggio, 1991; Zucker, 1987) adopts a more detached stance and emphasizes the ways in which institutional pressures transcend any single organization's control. Each tradition is further subdivided among researchers who focus on (a) legitimacy grounded in pragmatic assessments of stakeholder relations, (b) legitimacy grounded in normative evaluations of moral propriety, and (c) legitimacy grounded in cognitive definitions of appropriateness and interpretability (Aldrich & Fiol, 1994).

As this review indicates, legitimacy is more often invoked (it just "happens") than described, and it is more often described than defined (analyzed to be understood) (Terreberry, 1968). As a result the question "what is legitimacy?" often overlaps with the question "legitimacy for what?" The multifaceted character of legitimacy implies that it will operate differently in different contexts, and how it works may depend on the nature of the problems for which it is the purported

solution. Because of the many potential definitions, approaches and impacts of legitimacy, the approach I take in this dissertation is detailed in the following sections.

#### Potential Impact of Increased Legitimacy

I follow the strategic perspective that firms can and do employ a range of tactics in response to environmental conditions. On one hand firms may chose to obey rules and accept norms in order to achieve conformance legitimacy. On the other extreme, they may disguise nonconformity, change organizational strategies and goals, or attempt to influence institutional constituents (Oliver, 1991). These actions may be pursued in order to secure or increase higher levels of legitimacy. But just what do firms hope to gain by pursuing enhanced legitimacy?

Organizations seek legitimacy for many reasons. Conclusions about the importance, difficulty, and effectiveness of legitimation efforts may depend on the objectives against which these efforts are measured. A particularly important dimension in this regard is the



distinction between seeking passive support and seeking active support (Suchman, 1995; Kostova, 1999).

#### Passive versus active support

An underacknowledged distinction in studies of legitimacy centers on whether the organization seeks active support or merely passive acquiescence. If an organization simply wants a particular audience to leave it alone, the threshold of legitimation may be quite low. In the previous example of University accreditation, a school seeking passive support would seek to meet the minimum standards and avoid any infractions or complaints from or by the internal organization. An institution seeking the active support of published reputational rankings would verify the metrics to be evaluated in order to maximize the scores earned. In addition, such an institution will seek ways to know and directly influence the evaluators (e.g. retain a public relations firm).

In the case of firms conducting IPOs, a firm that merely conforms (or possesses little or no other differentiating evaluative characteristics) is seeking

only passive support. If, in contrast, an organization seeks protracted audience intervention (e.g. to enter into cooperative agreements), the legitimacy demands may be ramped up and stringent indeed (DiMaggio, 1988).

The contrast between passive and active support reveals one ramification of the differences between conforming and superordinate legitimacy. Conforming legitimacy is cognitive taken-for-grantedness. Firms that meet minimum standards are allowed by legitimacy gatekeepers to continue to operate. To avoid questioning by those able to confer legitimacy, an organization need only "make sense." But to mobilize affirmative commitments, (e.g. secure cooperative agreements) the organization must also create superordinate value.

In this study, I focus on informational indicators that may be utilized by gatekeepers of legitimacy to award superordinate levels of legitimacy. Regarding these indicators, firms are not required to conform, (e.g. a firm is not required to achieve a specific market-to-book ratio, or raise a specified dollar amount via the IPO) in order to be publicly traded. Rather these indicators are differentiating characteristics that may be used by social actors evaluating firms to

determine whether firms have value commensurate with above minimal levels of legitimacy.

### Complexity of the Institutional Environment

Organizational theorists long have recognized that institutional environments are complex and fragmented since they consist of multiple task environments (Galbraith, 1973; Lawrence & Lorsch, 1967; Thompson, 1967), multiple institutional "pillars" (Scott, 1995), multiple resource providers (Pfeffer & Salancik, 1978), and multiple stakeholders (Evan & Freeman, 1988). Institutional environments are fragmented and composed of different domains reflecting different types of institutions: regulatory, cognitive, and normative (Scott, 1995). In the course of their life cycle, firms are exposed to multiple sources of authority (Sundaram & Black, 1992). Government agencies, the public and the financial community are actors in the environment capable of conferring differing degrees of legitimacy on IPO firms.

### Environmental Constituencies

As discussed above, legitimacy is the endorsement or acceptance of an organization by social actors. Given that definition, a key step in understanding the legitimation process is identifying relevant social actors. In this research I follow Meyer and Scott (1983), Galaskiewicz (1985), and Baum and Oliver (1991) in arguing that only certain actors have the standing to confer legitimacy, particularly superordinate valuation.

It is necessary to identify the critical actors, whose approval is necessary to the fulfillment of an organization's functions. Each influences the flow of resources crucial to organizations' establishment, growth, and survival, either through direct control or by the communication of good will. Government and exchange regulators, the public and the financial community are all important actors affecting IPO firm legitimacy.

### Government and Stock Exchange Regulators

One important set of actors includes the government regulators who have authority over an organization (Baum & Oliver, 1991; Galaskiewicz, 1985; Meyer & Scott, 1983). The state Governmental bodies not only control critical resources directly through the awarding of contracts and

grants, but also indirectly influence the transfer of resources through regulation and legislation.

The key regulatory bodies of note in the IPO arena are the SEC and the stock exchange on which shares of the IPO firm will be traded. Both of these organizations establish, monitor and enforce the minimum legitimacy standards for IPO firms. The SEC enforces various securities laws requiring full disclosure (the IPO prospectus is one result of this requirement) and periodic reporting (e.g. annual 10K financial reports). The standards set by the exchanges focus on financial performance and liquidity. For example, the NASDAQ stock market requires that stock shares maintain greater than a one dollar per share price, that IPO firms have more than six million dollars in assets, and have a pre-tax income of more than one million dollars in the year prior to the issue. The New York Stock Exchange requires a firm to have more than 2,000 shareholders holding at least 100 shares each; a total market capitalization of at least sixty million dollars and pre-tax income of at least 2.5 million dollars in the preceeding year. These are minimum regulatory requirements which all listed firms

must meet--exceeding them would accrue increased legitimacy.

### The Public as a Source of Legitimacy

A second key actor is public opinion, which has the important role of setting and maintaining standards of acceptability related to the cognitive and normative pillars of legitimacy (Elsbach, 1994; Galaskiewicz, 1985; Meyer & Rowan, 1977; Meyer & Scott, 1983). For a firm seeking passive acceptance, meeting the public standard is relatively easy. Passive legitimacy is conferred on firms that are not noticeably bad community neighbors, don't break the law, and generally act the part of a going concern. For firms that fall short of the minimum standards, consumer groups and other "public interest" groups affect legislation and regulation directly through lobbying and indirectly through influence on voters.

If the firm desires active legitimacy support however, the standard is more exacting. For example, in the role of investor, the public must ultimately choose whether or not to provide resources to the firm by investing. The public in the role of customer also has

considerable impact on demand for the products of a firm through influence on the choices of consumers.

The public in general, also plays a vital role in the legitimation of organizational forms through the control of critical resources, not only on the demand side, but perhaps most importantly in the supply of labor. Because of these influences, public opinion is watched closely by the guardians of corporate legitimacy.

#### The Financial Community

The investment community as a whole plays a vital role in legitimating both new and established firms by determining the present values of firms based on rationalized appraisals intended to predict future returns on investment. This is a highly ritualized evaluation, by which the present value of a venture is based on collective assessments of future performance. Similarly, the accounting profession provides a rationalized appraisal of organizations' financial accounts. This appraisal is done both by internal accounting departments and by independent accounting firms. The dual functions of finance and accounting

together certify the economic legitimacy of every type of contemporary organization.

The techniques employed in financial analysis provide a system that integrates across the myriad institutional and individual perspectives on an organizational form's economic legitimacy. The schemas of finance and accounting present an overarching set of abstract categories and decision rules that coordinate across specialties and organizations.

The pillars of legitimacy indicate that regulative legitimacy is primarily that of conformance. Since firms either do or do not conform, (and relative to this study, those that do not conform are either not permitted to conduct the IPO, or are de-listed from the trading exchange) this dissertation will focus on the remaining two pillars of legitimacy by examining the evaluations of social actors in the general public and financial community.

#### Legitimation Through Resource Exchange

As Pfeffer and Salancik (1978) theorized, relationships with critical power centers that control vital resources are crucial for the maintenance of



organizational legitimacy. Based on such theorizing, however, we may encounter once again an apparently tautological relationship, now between resource acquisition and legitimacy. Legitimacy is obtained as resources are transferred from other institutions, yet (as this dissertation seeks to show) legitimacy is required before external actors will confer resources. This paradox can be resolved satisfactorily by recalling that legitimacy grows over time. Legitimacy accumulates as resources are obtained and resources accumulate as legitimacy is established. Resources are, in fact, a medium of legitimation and resource flows are among the best evidences of legitimation (Hybels, 1995).

Resources evidence legitimacy not simply because legitimation provokes the transferal of resources, but because resources are media by which approval and consent are expressed. Legitimacy exists only so long as it is instantiated in the transferal of resources, and that transfer must be ongoing to ensure the continual reproduction of legitimacy.

Legitimacy often has been conceptualized as simply one of many resources that organizations must obtain from their environments. But rather than viewing legitimacy

as something that is exchanged among institutions, legitimacy is better conceived as both part of the context for exchange and a by-product of exchange (Hybell, 1995). Legitimacy itself has no material form. It exists only as a symbolic representation of the collective evaluation of social actors, as evidenced to both observers and participants perhaps most convincingly by the flow of resources. In other words, it would be easy enough to pronounce that those firms that secured cooperative agreements possessed greater legitimacy than those that did not. This assessment could easily be made by viewing the flow of resources via the cooperative agreement(s). A more difficult task is in defining a priori the indicators of legitimacy that form the context of the resource transfer.

Terreberry provides a classic explanation of the relationship between resources and organizational legitimacy

*[T]he willingness of firm A to contribute to X, and of agency B to refer personnel to X, and firm C to buy X's product testifies to the legitimacy of X (1968: 608).*

I follow Hybel (1995) in viewing legitimacy as both the product and context of exchange in general.

Legitimacy accrues to firms through the exchange process, but exchange will take place only to the degree that the partners possess a degree of.

Firm's must have superordinate value to earn superordinate legitimacy. I argue that indicators of that value will also be indicators of firm legitimacy. Further, that larger firms evaluating IPO firm value will confer higher levels of legitimacy to those firms with higher levels of those key indicators. In this dissertation, potential indicators of legitimacy (the context upon which exchange is based) are the primary concern. Existing research on partner selection, reputation, gauges of firm quality and ability to perform suggests several potential indicators of IPO firm legitimacy including 1) age, 2) size, 3) retained shares of equity, 4) market-to-book value, and 5) IPO total value (proceeds attracted).

#### Age Legitimacy

Organizational ecologists have found that a firms ability to perform varies with age (Henderson, 1999). Research has used several labels to describe the relationship between age and failure, including (1) the

liability of newness (Stinchcombe, 1965; Hannan and Freeman, 1984), (2) the liability of adolescence (Levinthal and Fichman, 1988; Bruderl and Schussler, 1990), and (3) the liability of obsolescence (Baum, 1989; Ingram, 1993; Barron, West, and Hannan, 1994).

A liability of newness suggests that selection processes favor older, more reliable organizations, so failure rates are expected to decrease monotonically with age (Freeman, Carroll, and Hannan, 1983; Hannan and Freeman, 1984). According to the liability of newness perspective, older organizations have an advantage over younger ones because it is easier to continue existing routines than to create new ones or borrow old ones (Henderson, 99; Krackhardt, 96; Brudl, 90; Stinchcombe, 1965; Nelson and Winter, 1982). Hannan and Freeman (1984) argued that selection processes tend to favor firms that exhibit high levels of reliability and accountability in their performance, routines, and structure. Because reliability and accountability tend to increase with age, failure rates tend to decrease as firms grow older. Young firms are particularly likely to fail because they must divert scarce resources away from operations to train employees, develop internal routines,

and establish credible exchange relationships. Several empirical studies have provided support for the liability of newness (e.g., Brudl, 90; Henderson, 99; Carroll, 1983; Freeman, Carroll, and Hannan, 1983). The implication for cooperative agreements is of course that the likelihood of a partner surviving to accomplish the goals of the partnership increase with firm age. While age may play an important role in indicating firm quality, research shows that firm size may also be a significant indicator of firm legitimacy.

#### Size Legitimacy

While many studies have found a relationship between firm age and the ability to perform, other scholars (Baum, 1989; Ingram, 1993; Barron, West, and Hannan, 1994; Ranger-Moore, 1997) have advanced a very different perspective. They have observed that most prior work has neglected to account for the age-varying effects of size. If firm size tends to increase with age, and failure rates decrease with size, then negative relationships between age and failure were probably due to differences in size rather than to the causal effects of age. Those authors noted that in the few studies in which size was

included as a time-varying control (e.g., Barnett, 1990; Baum and Oliver, 1991), the relationship between age and failure rates was actually positive (see Baum, 1996). Barron, West, and Hannan (1994) and Ranger-Moore (1997) have replicated such results. When they excluded time-varying size, the relationship between age and failure was negative and significant, but it became positive and significant when size was accounted for.

Smaller firms may fail at higher rates (Freeman, Carroll, and Hannan, 1983) because they are less inertial than larger ones or because they lack legitimacy, access to capital, and stable relationships with external constituents (Stinchcombe, 1965; Hannan and Freeman, 1984, 1989).

The implications for this dissertation are twofold. First, given the results of the research presented above, using age alone as a measure of legitimacy may be inappropriate. Second, the ability for firms to support the human and financial resource requirements of cooperative agreements appears to increase with size. The potential value of firm age and size as indicators of firm legitimacy are results of entrepreneurship, organization theory, and strategy research. Economics

and finance research suggests an additional three measures: retained equity shares; market-to-book ratio; and IPO total.

#### Retained Equity Shares Legitimacy

A large stream of finance literature investigates messages (or signals) that are available in widely available information, yet convey information about factors for which little or no information is available. One of the most widely researched value signalling indicators in the finance literature is the percentage of equity retained by a firm at the time of IPO. The first major test of equity retention as an indicator of inside information on firm quality was published in Leland and Pyle's (1977) seminal work. Leland and Pyle (1977) found that although a great deal of information is made public during the IPO process, informational asymmetries are still pronounced. They found that entrepreneurs within the firm, having nearly perfect information, hold perceptions of the future value of the firm. If the entrepreneurs believed the future for the firm was bleak, they would retain as few shares at the time of IPO as possible, and maximize their opportunity to cash out. If

on the other hand they believed the long-term value of the firm was greater than the proceeds immediately available from the IPO, they would be more inclined to retain a greater number of shares.

Other finance scholars have replicated and extended Leland and Pyle's work. Keasey and McGuinness (1992) reviewed a series of these follow on studies (e.g. Downes and Heinkel, 1982; Ritter, 1984; and Krinsky and Rotenberg, 1989) and found continued support for the use of retained equity as a signal of firm quality. Other studies have verified the signal in various countries (Keloharju and Kulp, 1996) and in conjunction with added controls such as the length of time the retained shares were held (Courteau, 1995; Grinblatt and Hwang, 1989). I propose that this indicator of firm quality, which has been useful in predicting firm value post-IPO, also provides information on firm legitimacy to potential cooperative agreement partners.

#### Market-to-Book Legitimacy

Fama and French's (1995) work is indicative of another potential IPO indicator of firm quality. They found that the ratio of market value to firm book value



is positively related to post-IPO increases in firm value. Keloharju and Kulp found a similar relationship between market-to-book at the time of IPO and firm value creation. This ratio is a signal of firm potential at the time of IPO by social actors in the public and financial communities. While this signal may be of diminishing value for IPOs conducted recently (given the tremendous growth in relatively low capitalized Internet and digitally based IPOs) I argue that it will prove valid for 1993 IPO firms. Following the logic above, I propose that market-to-book will also be an indicator of firm legitimacy at IPO.

#### IPO total value Legitimacy

Recent IPO research (e.g. see Deeds, Decarolis, and Coombs, 1997; Deeds, Mang, and Frandsen, In Press) often views the goal of the IPO as providing capital to entrepreneurial firms. The direct measure of variability in IPO firm legitimacy was in the total financing (proceeds) raised at the time of IPO. If the major objective of going public is access to capital, then there is no better measure of the financial and investment communities' assessment of IPO firm legitimacy

than the total value of funds raised as a result of the offer.

## COOPERATIVE AGREEMENTS

Interfirm cooperative agreements (CAs) take place when two or more otherwise independent organizations act together to pursue mutual gain (Borys and Jemison, 1989). These cooperative agreements can take the form of strategic alliances, research and development agreements, marketing agreements, licensing pacts etc.

A cooperative strategy may afford competitive advantage to firms lacking in particular competencies or complementary resources by linking with firms that do possess the skills or assets (Child and Faulkner, 1998). In addition to providing access to resources that would otherwise be unavailable or cost prohibitive, CAs also may allow firms to acquire key resources in the most time efficient manner, or provide access to suppliers and markets which may otherwise be inaccessible (Doz and Hammel, 1998). Table 1 below reviews some of the many reasons firm cite for forming cooperative agreements.

TABLE 1

## REASONS FIRMS FORM COOPERATIVE AGREEMENTS

|  |   |
|--|---|
| Acquire Technology-based Capabilities                    | Kogut, 1988; Hamel, Doz, & Prahalad, 1989; Cohen & Levinthal, 1990; Hamel, 1991; Meyer & Alvarez 1998; Lane, 1997; Lane and Lubatkin, 1998; Robertson and Gatignon, 1998.   |
| Acquire Tacit Knowledge or Learning.                     | Kogut, 1988; Harrigan, 1988; Doz, Hamel & Prahalad, 1989; Hamel, 1991; Khanna, Gulati, & Nohria, 1998; Mowery, Oxley & Silverman, 1996; Eisenhardt & Schoonhoven, 1996.   |
| Convergence of Technologies                              | Mariti & Smiley, 1983; Hagedoorn, 1993; Borys & Jemison, 1989; Pisano, 1991; Kogut, 1988; Kogut & Singh, 1988.  |
| Reduction of Development time                            | Contractor & Lorange, 1988; Bleeke & Ernst, 1992; Nohria & Garcia-Pont 1991; Ohmae, 1989; Hamel & Prahalad, 1993; Hagedoorn, 1993; Kogut & Singh, 1988; Osborn & Baugh, 1990; Eisenhardt & Schoonhoven, 1994.                                 |
| Reduce or Share Costs                                    | Root, 1988; Harrigan, 1988; Borys & Jemison, 1989; Kogut, 1991; Hagedoorn, 1993, 1995.  |
| Economies of Scale Production/Dist/R&D                   | Nohria & Garcia-Pont, 1991; Buckley & Casson, 1988; Hennart, 1988; Hagedoorn, 1993, 1995; Pisano, 1990; Ring & Van de Ven, 1992; Osborn & Baugh, 1990.  |
| Synergy Effects From Exchanging & Sharing Know How & R&D | Hennart, 1988, 1991; Burgers, Charles, Hill & Chan, 1993; Pisano, 1990; Borys & Jemison, 1989; Shan, 1990; Hamel, 1991; Osborn & Baugh, 1990; Hagedoorn, 1993, 1995; Hagedoorn & Schakenraad, 1990. Meyer & Alvarez, 1998.                    |
| Tacit Collusion  | Hamel, 1991; Hamel, Doz, & Prahalad, 1989; Hamel & Prahalad, 1993; Mariti & Smiley, 1983; Hennart, 1988.  |
| License Technology                                       | Hagedoorn, 1993; Ohmae 1989; Hennart, 1988, 1991; Ring & Van de Ven, 1992; Osborn & Baugh, 1990.  |
| Acquire rights to products/markets                       | Hamel, 1991; Buckley & Casson, 1988; Borys & Jemison, 1989; Root, 1988; Burgers, Charles, Hill & Chan, 1993; Harrigan 1988; Parkhe, 1993a, 1993b; Kogut & Singh, 1988; Osborn & Baugh, 1990; Hagedoorn, 1993, 1995.                           |
| Transaction Cost Savings                                 | Williamson, 1985, 1991; Pisano, 1989; Hennart, 1988. Deeds & Hill, 1999.  |
| Transitional Governance Mode Before Acquisition          | Borys & Jemison, 1989; Kogut, 1991; Buckley & Casson, 1988.   |
| Monitor/control Partner's Technology                     | Burgers, Charles, Hill & Chan, 1993; Kogut, 1988; Hagedoorn, 1993, 1995; Nielsen, 1988.   |
| Access to New Market/Product Developments                | Eisenhardt & Schoonhoven, 1994; Hamel, Doz, & Prahalad, 1989; Kogut, 1988; Harrigan 1988; Hamel, 1991; Borys & Jemison, 1989; Powell, 1987; Terpstra and Simonin, 1993; Hagedoorn, 1993; Hitt, Tyler, Hardee, Park, 1995. Deeds & Hill, 1996. |

|   |  |
|---|--|
| Influence & Neutralize the Competitive Industry/Market Stuct. To Reduce Uncertainty | Harrigan, 1988; Burgers, Charles, Hill & Chan, 1993; Nielsen, 1988; Kogut, 1988; Contractor & Lorange, 1988; Das & Teng, 1996. |
| Gain Legitimacy   | Sharfman, Gray, & Yan, 1991; Baum & Oliver, 1991, 1992.  |
| Mimic Other Firms That Have Entered Alliances.                                      | Venkatraman, Koh, & Loh, 1994.   |
| Competitive strategy.   | Mowery, Oxley, & Silverman, 1996; Harrigan, 1988; Hagedoorn & Schakenraad, 1990; Eisenhardt & Schoonhoven, 1996.               |
| Improve strategic position.   | Porter & Fuller, 1986; Contractor & Lorange, 1988; Kogut, 1988.  |
| Improve performance in under-performing firms.                                      | Mohanram & Nanda, 1996. Gulati, 1995.  |
| Increase sales and growth.  | Mitchell & Singh, 1996.  |
| Entrepreneurial Firm Growth   | Botkins & Matthews, 1992; Deeds & Hill, 1996; Human and Provan, 1997; Meyer & Alvarez, 1998.                                   |
| Influence the Number and Structure of Alliance Competitors.                         | Burgers, Charles, Hill & Chan, 1993; Parkhe, 1993a; Nohria & Garcia-Pont, 1991; Gulati, 1995, 1997, 1998.                      |

\*The author would like to gratefully acknowledge Sharon Alvarez (1999) for allowing me to adapt her version of this table.

The preceding broadly sketched introduction to CAs bases the formation of CAs on two key elements: 1) overcoming resource-based constraints to firm growth (Hammel, 1991) and 2) minimizing the cost of organizational activities (Hesterly, Liebeskind, and Zenger, 1990; Williamson, 1994). Each of these elements spring from rich fields of study—the resource-based view (RBV) (e.g. Wernerfelt, 1984; Barney, 1991; and Peteraf, 1993) and industrial organization economics (OE) (e.g. Williamson, 1975; Barney and Ouchi, 1986).

A brief note should be made on the term "strategic alliance." The terms strategic alliances or alliances

often refer to "voluntarily initiated cooperative agreements between firms that involves exchange, sharing, or co-development, and can include contributions by partners of capital, technology, or firm specific assets (Gulati, 1999). However, the term strategic alliance has also been used in a more narrow regard, referring only to inter-firm agreements in which specific firm assets remain autonomous (e.g. Dussauge and Garrette, 1997). This definition excludes co-located research and development agreements, equity investments, vertical partnerships between suppliers and manufacturers, and joint venture start-ups. Given the variation in definition of the term 'strategic alliance,' it is avoided in this dissertation. While the investigation of specific types of inter-firm agreements in depth is no doubt useful and relevant, I follow Parkhe (1993) and Burgers et al (1993) in investigating the global problem of inter-firm cooperation. As is shown later in this chapter, the form of cooperation chosen is often a result of the resources desired or the selection of the most efficient means of resource transfer. The interest of this dissertation is in the act of cooperation itself, not in the specific form the cooperation takes.

The value of a potential CA may vary depending upon whether a firm views its primary goal as securing resources (RBV) or in maximizing operating efficiencies (OE). Combs and Ketchen (1999) found that some resource poor firms often face a dilemma in that a RBV analysis encourages cooperation, but an OE perspective discourages cooperation. For example, a CA may allow a firm access to key resources, but the financial commitment or time delay before putting the acquired resources into action may be significantly detrimental to the firm. Empirical research indicates that the most promising resolution in the case of such direct opposition is that resource poor firms will have to pursue CAs even when cooperation is not prudent from an OE perspective (Combs and Ketchen, 1999).

While the basis of this dissertation rests on the importance of resources—which resources are acquired and how efficiently are they acquired in CAs, there are many other important facets of CAs that should be acknowledged. Scholars have investigated the potential benefits of CAs (Inkpen, 1998), the potential detriments of CAs (Miles, Preece, and Baetz, 1999), the partner selection process (Chung, Singh and Lee, 2000; Hitt,

Dacin, Levitas, 1998) the importance of trust (Das and Bing-Sheng, AMR 1998; Jones and George, 1998), cooperation as firm strategy (Golden and Dollinger, 1993), vertical versus horizontal CAs (Reijnders and Verhallen, 1996), and determinants of success and failure of CAs (Meyer and Alvarez, 1998). Each of these areas of research brings a differing focus to CA investigation, and many of them will be discussed in greater detail in the hypotheses development section of the next chapter. In as much as my view of CAs focuses on resources and recalling that both the context and quantification of the legitimation process are resource based, the remainder of the theoretical development focuses on the importance of resources in CAs. In the following section, I utilize the framework of Combs and Ketchan (1999) in reviewing CAs from the resource-based and then the organizational economics perspective.

#### The Decision to Cooperate: Resource-Based or Organizational Economics

Today, industries are subject to rapid technological change that necessitates integration of resources and the networks to exploit them in short time spans (D'Aveni,

1994; Grant and Baden-Fuller, 1995). Even the most well resource endowed firms seldom find a perfect match between current resources and the resources required in order to satisfy customer needs. (Alvarez, 1999). Whether it is a physical or intangible resource that is lacking, firms often turn to cooperative agreements to acquire that resource.

But should a firm pursue a cooperative inter-firm agreement? Cooperation is advisable under the resource-based view if each firm gains access to resources and in so doing, overcome barriers to growth. According to organizational economics, should take place only if it results in greater efficiencies in controlling and monitoring firm activities (Hesterly, Liebskind, and Zenger, 1990).

It is highly unlikely that a manager would not consider the impact of both the resources gained and the gain or loss of efficiency resulting from any potential cooperative agreement. It follows that both the resource-based view and the organizational economics view offer valuable evaluation perspectives for potential cooperative agreements. However, Combs and Ketchen (1999) posit that these views are often in opposition,



and given that opposition, a resource poor firm should pursue cooperation, even if efficiencies are not gained via the cooperation.

Cooperative agreements then can be viewed as both a means of acquiring critical firm resources by surmounting barriers to acquisition, and as a means of improving firm efficiency and reducing transaction costs by acquiring resources in the most effective method possible.

The hypothetical relationships between firm legitimacy and cooperative agreements; cooperative agreements and firm performance; and the mediating role that cooperative agreements play between legitimacy and performance are presented in Chapter III.

# CHAPTER III

## DEVELOPMENT OF HYPOTHESES

### INTRODUCTION

In this chapter I provide an in-depth theoretical development of the dissertation model by deriving research hypotheses from the broad research questions introduced in Chapter I. The chapter develops the links between the three major dissertation constructs of legitimacy, cooperative agreements and performance. The expected relationship between firm legitimacy at the time of IPO and subsequent increases in quantity and quality of cooperative agreements is described. Finally, the chapter develops specific hypotheses outlining the expected relationships between increases in cooperative agreements and firm performance.

#### The Link Between Legitimacy and Cooperative Agreements

The literature indicates that legitimacy provides the firm with access to a variety of resources—capital, suppliers, customers, clients, governmental support, knowledge, etc. (Hannan and Freeman 1977; Meyer and Rowan 1977; Tolbert and Zucker 1983; Oliver 1990; Singh, Tucker

et al. 1991; Aldrich and Fiol 1994; Meyer 1994; Scott 1995; Deeds, Decarolis et al. 1997). One potential method for obtaining these resources is through cooperative agreements. Given that cooperative agreements may present the most cost effective and least time consuming manner for obtaining critical resources, firms with the requisite legitimacy necessary to enter such agreements would do so.

Several studies have found both causal and non-causal relationships between legitimacy and cooperative agreements. Experimental research has found a causal relationship between the reputation (i.e. legitimacy) characteristics of a firm and the degree to which other firms would participate in alliances (Dollinger 1985). Dacin, Hitt and Levitas (1997) found that financial health and reputation are key criteria in the selection of cooperative agreement partners. Oliver (1988) found that reputation and legitimacy lead to alliances and other interorganizational relationships. Extant research also shows a relationship between the level of legitimacy and the number of alliances a firm is party to (Deeds, Mang et al. 1999 in press). In addition, a relationship between increased legitimacy and cooperative agreements

in non-IPO firms has been found (Baum and Oliver 1991; Sharfman, Gray et al. 1991). James (1995) found that participation in alliances signaled the level of institutional legitimacy resident in the firm.

Accounting signaling literature reveals that indicators of legitimacy (firm size, age, IPO underwriter, percentage of retained IPO equity, management team experience, market to book ratio, and IPO value) have been shown to signal levels of legitimacy to firm evaluators (Clarkson, Dontoh et al. 1991; Clarkson, Dontoh et al. 1992; Keasey and McGuinness 1992; Keasey, McGuinness et al. 1992; Courteau 1995; Keloharju and Kulp 1996).

These findings lead to the first hypothesis regarding firm legitimacy and cooperative agreements.

**H1a: Firm legitimacy at IPO will be positively related to the change in number of cooperative agreements post-IPO.**

This hypothesized relationship as shown in Figure 1 below.

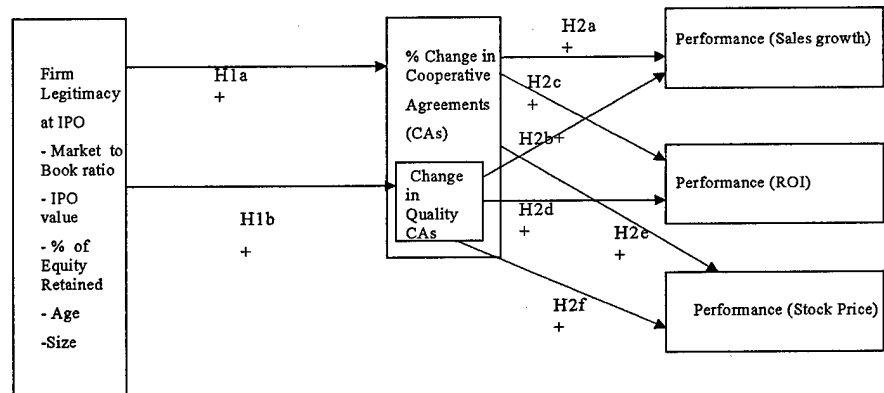


Figure 1

Relatively little research effort has been devoted to the critically important process of partner selection in alliance formation (Glaister 1996; Dacin, Hitt et al. 1997). Research has shown that large firms typically identify an opportunity and seek some critical capacity from a "world-class small partner" (Slowinski, Seelig et al. 1996, 1). I posit that the quality of a firm's cooperative agreements can be seen in the number of cooperative agreements entered into with Fortune 500 firms. These large, industry leaders can offer new venture partners better access to resources and markets. As a result larger firms have a larger pool of potential partners, and thus can be more selective in choosing cooperative agreement partners. Those potential partners

with the highest legitimacy will be selected for more quality partnerships. This leads to the next hypothesis.

**H1b: Firm legitimacy at IPO will be positively related to the change in quality of cooperative agreements post-IPO.**

The link between cooperative agreements and firm performance

The alliance literature has many examples of the impact of cooperative agreement use on firm performance. Research has shown a direct relationship between utilization of cooperative agreements and firm performance by under-performing firms (Mohanram & Nanda, 1996; Gulati, 1995). In particular, cooperative agreements have been shown to increase sales and growth (Mitchell & Singh, 1996; Zimmerman, 1999).

Venkataraman and Ramanujam (1987) note that financial measures of performance reflect the economic fulfillment of firm goals. Sales growth is one of the most used measures of performance in entrepreneurship studies (Murphy et al, 1993). Sales growth is necessary for funding of new ventures, and indicative of increasing customer acceptance of firm products (Robinson, 1998). Sales growth is believed to be the best measure of firm

growth since it reflects both short and long-term changes in the firm (Hoy, McDougall et al. 1992), and is the most often used measure of growth by entrepreneurs themselves (Wiklund 1998). I posit that the use of cooperative agreements will have a positive impact on firm performance as measured by firm sales growth. This thesis is indicated in the next series of hypotheses.

**H2a: The change in the number of firm cooperative agreements post-IPO will be positively related to firm sales growth.**

**H2b: The change in the quality of firm cooperative agreements post-IPO will be positively related to firm sales growth.**

In addition, extant research reveals indirect performance impacts of cooperative agreement use as well. Cooperative agreements have been shown to reduce costs (Harrigan 1988; Borys and Jemison 1989; Kogut 1991; Hagedoorn 1993; Hagedoorn 1995) provide economies of scale (Buckley and Casson 1988; Hennart 1988; Osborn and Baughn 1990; Pisano 1990; Nohria and Garcia-Pont 1991; Ring and Van De Ven 1992; Hagedoorn 1993; Hagedoorn 1995); facilitate the acquisition of technology based capabilities (Kogut 1988; Meyer and Alvarez 1998); enable acquisition of tacit knowledge and other learning

(Mowery, Oxley et al. 1996; Meyer and Alvarez 1997); and provide transaction cost savings for the firm (Riordan and Williamson 1985; Hennart 1988; Pisano 1990).

Return on investment is also one of the most commonly used new venture performance measures (Murphy, Trailer et al. 1993; Murphy, Trailer et al. 1996) and an indicator of management's effectiveness in employing the capital available to the firm (Robinson 1998). The efficiencies detailed above should lead to lower costs and subsequently increase firm return on investment as indicated in the following hypotheses.

**H2c: The change in the number of firm cooperative agreements post-IPO will be positively related to firm return on investment.**

**H2d: The change in the quality of firm cooperative agreements post-IPO will be positively related to firm return on investment.**

In addition to positive impacts of cooperative agreements on sales growth, and ROI, the change in firm stock price will also be affected. Stock price growth was selected as a performance measure because it represents the view of analysts and investors of firm financial health (Welbourne, Meyer et al. 1998) and is the most used measure of firm performance in the IPO literature (Ibbotson and Ritter 1995).



H2e: The change in the number of firm cooperative agreements post-IPO will be positively related to change in firm stock price.

H2f: The change in the quality of firm cooperative agreements post-IPO will be positively related to change in firm stock price.

The role of an increase in cooperative agreements as mediator

Baron and Kenny (1986) describe moderator variables as describing when certain effects will hold to be true, while mediators specify how or why such effects occur. Thus, a variable is said to function as a mediator to the extent it accounts for the relationship between the predictor and dependent variables (Baron and Kenny, 1986).

The model depicted in Figure 1 indicates a mediating role for increases in number and quality of cooperative agreements, between the legitimacy predictor variables, and the performance dependent variables. I propose in the hypotheses above that 1) the legitimacy variables at the time of IPO ( $t_0$ ), predict an increase in the number and quality of cooperative agreements entered into following the IPO ( $t_1$ ), and 2) an increase in number and

quality of cooperative agreements at  $t_1$  predicts firm performance at  $t_3$ . The linkage of the variable sets (predictors, mediators, dependent variables) indicates a mediating relationship. In other words, I am proposing that a change in number and quality of cooperative agreements accounts for a significant portion of the relationship (if any) between the legitimacy variables and the firm performance variables.

The linkage longitudinally of the variables requires tests to be performed to verify the proposed mediation role played by cooperative agreements. The results of these tests are thoroughly reviewed in chapter IV.

It may be helpful at this point to conceptually review the potential impact of tests of mediation found in the following chapter. Should there prove to be no mediation effect, there are two possible conclusions to be drawn. First, the legitimacy variables may be indicators of firm performance rather than being indicators of increases in cooperative agreements. In this case, both the legitimacy variables and the change in cooperative agreements variables should be depicted as independent variables effecting firm performance (see figure 2).

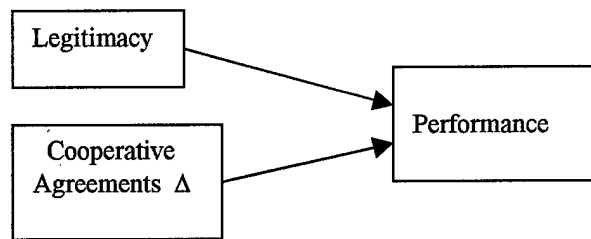


Figure 2

Second, while the legitimacy indicators may predict a change in cooperative agreements, they may have no relationship with the firm performance variables. In this case, a more appropriate depiction of the variable relationship would be two separate models (see figure 3). The first model would indicate a relationship between the legitimacy predictors and the dependent variables: change in number and quality of cooperative agreements. The second independent model would then depict the relationship between a new set of predictor variables (the change in cooperative agreements) and the performance dependent variables.

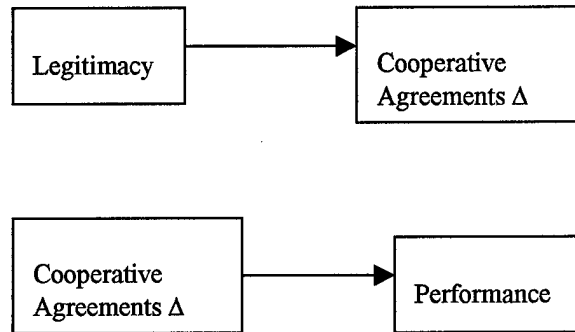


Figure 3

Third, the legitimacy predictors may have a significant relationship with the firm performance variables that is not effected by the proposed mediator. In this case, the proper depiction of the relationship would include a third relationship in addition to the two listed in option two preceding: a model that would indicate a relationship between legitimacy variables as IVs and performance variables as DVs (see Figure 4).

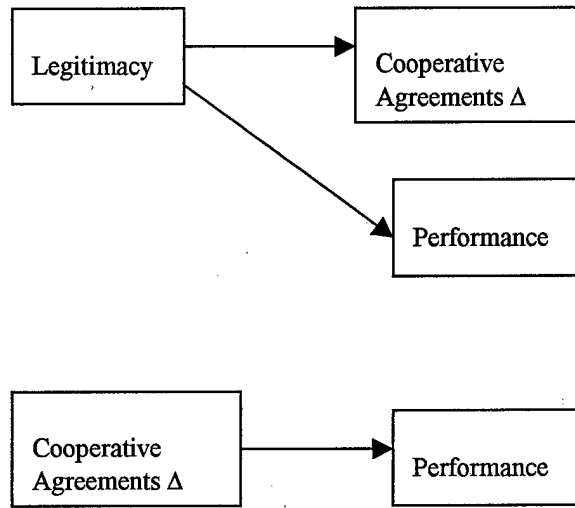


Figure 4

## CHAPTER IV

### METHODOLOGY

#### INTRODUCTION

In order to examine the effects of the relationship between firm legitimacy, cooperative agreements and firm performance, this research project utilizes secondary data, from a number of databases, on IPO firms. These data are analyzed with factor analysis, analysis of variance, and multiple regression.

#### SAMPLE DEFINITION

This research is concerned with the change in cooperative agreements which IPO firms experience post IPO and the subsequent change in firm performance. A group of firms which completed an IPO in 1993 is examined. Firm characteristics at IPO are examined since: 1) firms undergo a tremendous amount of scrutiny immediately prior to the IPO, thus if legitimacy factors are to be discovered, they are most likely to be discovered by constituents in the environment during this

time period, and acted on soon afterword; and 2) firms document key legitimacy factors in the form of the IPO prospectus, which makes this information uniquely available at the time of IPO.

The list of IPO firms being examined is a subset of the firms analyzed by Welbourne, Meyer and Neck (1998) and Welbourne and Cyr (1999). The full list included all 703 firms that went public during 1993. Of those firms, 585 produced a good or service and prospectuses were obtained from 535 firms. The specific industries examined in this study are Chemicals and Allied Products; Machinery and Computers; Electrical, not computers; Measuring, Analyzing, and Controlling Instruments; Communications; and Business Services. These industries were selected as they 1) account for nearly half of all 1993 firm IPOs in just six of the 87 2 digit industry SIC codes and 2) the selected industries differ enough in broad terms (service versus manufacturing; high research and development requirements versus low etc.) that variance by industry type can be examined. Firms from these industries totaled 237 and represent 44% of available 1993 IPO firms.

### Data Collection

The data were obtained from five different sources. Information on the firm age, size, and sales prior to IPO was obtained from firm prospectuses. Information on firm industry, market to book ratio, stock price, percentage of equity retained at IPO, and IPO total value were obtained from the Securities Data Company New Ventures database. Information on sales post-IPO, firm ROI and firm Fortune 500 ranking was collected from the COMPUSTAT database. In addition, the COMPUSTAT database was used as an additional source to verify industry, market-to-book, and price information. Information on firm cooperative agreements entered into was collected from the Securities Data Company Joint Venture database. Finally, SEC 10K filings were utilized to supplement and verify sales and ROI information.

Next, 30 firms were eliminated (leaving N=207) that either did not have 1) at least partial IV information available, 2) and partial DV information available or 3) had CUSIP mismatches between databases. (CUSIP is a unique six alphanumeric identifier for a firm that is trademarked by the American Banker's Association and



stands for "Committee on Uniform Security Identification Procedures")

The sum of all firms by industry can be seen in Table 2.

Table 2  
Industry: SIC X Frequency

| Industry   | SIC (2 digit) | n  |
|--|---------------|----|
| Chemicals  | 28            | 32 |
| Industrial & Commercial Machinery & Computer Equipment | 35            | 40 |
| Electrical Equipment except computers                  | 36            | 38 |
| Measurement Instruments                                | 38            | 32 |
| Communications   | 48            | 21 |
| Business Services                                      | 73            | 44 |

#### VARIABLE MEASUREMENT

##### Performance Measurement

Firm performance is relative depending upon the vantage point from which it is assessed. Researchers attempting the measurement of performance in the study of IPO firms have availed themselves of a multitude of vantage points. Some of the performance measures examined include failure rates (Robertson, 1970; Faucett, 1972), return on equity Beard and Dess, 1981; Lamont and Anderson, 1985; Miller and Friesen, 1982; and Keats and Hitt, 1988) average annual earnings (Rotch, 1968;

Oevirtz, 1985), return on assets (Snow and Hrebiniak, 1980; Bourgeois, 1985; Lamont and Anderson, 1985; Frederickson and Mitchell, 1984; Lenz, 1980; Cowley, 1988; Hill and Snell, 1988), sales growth (Norburn and Birley, 1988; Lamont and Anderson, 1985; Frederickson and Mitchell, 1984, Miller and Friesen, 1982, Dollinger, 1984) return on sales growth (Peters and Waterman, 1982; Woo and Willard, 1983; Bourgeois, 1985; Cowley, 1988) compound annual rates of return (Bygrave et al, 1988), returns (Brophy and Verga, 1988; Bygrave and Stein, 1989), and pricing of stock (Hitt and Ireland, 1985; Welch, 1984; Keats and Hitt, 1988; Brophy and Verga, 1988; Mcflain and Kraus, 1989; Barry et al, 1990).

These cites, while not all inclusive, illustrate the multitude of methods utilized to measure firm performance. Thorough reviews of firm performance variable operationalization have found the use of accounting measures to be by far the most popular in the literature (Scherer, 1980; Fischer and McGowan, 1983; Hofer and Schendel, 1978). The widespread use of these measures in entrepreneurship and strategy literature is attributable to their general availability to the public, and effectiveness in communicating information on recent firm operations (Barney, 1997).

While one might be tempted to incorporate a multitude of financial measures in a research design, it

should be noted that Bettis (1981) found that most financial performance measures are highly intercorrelated. As a result, Hitt (1988) concluded that one accounting based measure may be as good as several.

There are limitations to using accounting measures. They are subject to managerial discretion. Managerial rewards often are based on accounting measures, which may result in managerial selection or modification of accounting methods which indicates the most favorable firm performance (Hamermesh and Christiansen, 1981; Watts and Zimmerman, 1986). These measures are also susceptible to short term bias. Long term investment costs, such as cooperative agreement or research and development expense are treated as costs in the current accounting period, even though the payback for these investments will not be realized for many years (Barney, 1997). An associated limitation of accounting measures is that they undervalue a firm's intangible resources. Ongoing development of cooperative agreements, firm knowledge, relationships with customers etc. are impossible to quantify on the balance sheet, but can have a significant impact on firm performance (Itami, 1987; Barney, 1991).

Despite these limitations, some firm constituents continue to use accounting measures as a means to evaluate firm performance. Woo and Willard (1983) found

that despite their limitations, accounting measures which attempted to capture firm profitability (e.g. ROI, ROE, ROA) remain essential to comprehensive representation of firm performance, when utilized in conjunction with other measures.

Another type of performance measure is the change in market performance or stock price experienced by the firm. Market measures of performance are an indicator of investors' expectations about future earnings and as such this would primarily indicate that this is a long-run-perspective (Keats and Hitt, 1988; Fryxell and Barton, 1990). The use of these measures assumes that capital markets are efficient and reflect all publicly available information about the economic value of the firm (Fama, 1970). Efficient markets process firm information quickly (e.g. announcements of a cooperative agreements) and reflect the market judgement on the potential impact of changes in firm strategy in stock price. There are many advantages to using market measures of performance. They include: stock price is the only direct measure of stockholder value; stock price represents all information aspects of performance; price information is easily obtainable; stock prices are objectively reported; and they are not subject to management manipulation (Lubatkin and Schievers, 1986).

Use of market measures is limited by the potential

impact of industry effects, macro economic impacts on markets, and information asymmetry. A further limitation is the central assumption of market measures that the only stakeholder of importance is the fully diversified investor in firm equity. While this assumption is key to financial theory, it is in direct opposition to strategy theory, which stresses the importance of multiple stakeholder groups (Lubatkin and Schievers, 1986).

Firm performance as evaluated by external constituents (e.g. customers) is also of great importance as satisfying the customer is essential to long-term firm growth and survival. Sales growth is one of the most used measures of performance in entrepreneurship studies (Murphy et al, 1993). Sales growth is necessary for funding of new ventures, and indicative of increasing customer acceptance of firm products (Robinson, 1998). Sales growth is believed to be the best measure of firm growth since it reflects both short and long-term changes in the firm (Hoy, McDougall et al. 1992), and is the most often used measure of growth by entrepreneurs themselves

While sales growth is technically an accounting measure as discussed above, it is not a return ratio. In other words, as used in this research, it reflects only

the ability of the firm to reach additional customers and to satisfy those customers in order to grow sales, not the immediate impact of that growth on firm profit or loss.

While the finance literature would suggest that market performance (shareholder wealth) is the ultimate firm performance criteria (Weston and Brigham, 1978; Johnson, Natarajan, and Rappaport, 1985) this argument ignores the fundamental concerns of strategic management (Bettis, 1983). The strengths and weaknesses of each type of measure discussed above indicate the importance of avoiding a single measure of performance. Given these arguments the exclusive use of only one type of measure would result in an incomplete picture of firm performance (Keats, 1990). Additionally, in the period following the IPO, any one financial measure may not adequately measure the firm's performance. As Barney (1997:63) concludes "multiple measures of performance should often be used in strategic analysis." This research will therefore include three types of performance measures--financial-based, market-based, and customer-based.

The first measure of performance selected for this study is a financial measure of performance.

Venkataraman and Ramanujam (1987) note that financial measures of performance reflect the economic fulfillment of firm goals. Return On Investment (**ROI**) for the year ending 1995 will be utilized as the financial measure of performance for this study. **ROI** is one of the most commonly used new venture performance measures (Miller et al, 1988; Murphy, Trailer et al. 1993; Murphy, Trailer et al. 1996) and an indicator of management's effectiveness in employing the capital available to the firm (Robinson 1998). **ROI** is used to indicate the firm's efficient use of the equity provided by the owners, or owners' performance. **ROI** renders a different picture of the organization's overall performance than other measures of performance by presenting a specific indication of profitability to the owners which is watched closely by the financial community (Helfert, 1937). The widespread use of **ROI** as a performance measure in strategy research will allow for comparisons between this and other studies.

The efficiencies gained through utilization of cooperative agreements should lead to lower costs and subsequently increase firm return on investment. These efficiencies impacting firms as a result of cooperative

agreements include a reduction in cost (Harrigan 1988; Borys and Jemison 1989; Kogut 1991; Hagedoorn 1993; Hagedoorn 1995) provision of economies of scale (Buckley and Casson 1988; Hennart 1988; Osborn and Baughn 1990; Pisano 1990; Nohria and Garcia-Pont 1991; Ring and Van De Ven 1992; Hagedoorn 1993; Hagedoorn 1995); facilitation of the acquisition of technology based capabilities (Kogut 1988; Meyer and Alvarez 1998); enabling acquisition of tacit knowledge and other learning (Mowery, Oxley et al. 1996; Meyer and Alvarez 1997); and providing transaction cost savings for the firm (Riordan and Williamson 1985; Hennart 1988; Pisano 1990). Summary statistics for the variable **ROI** are shown in Table 3.



Table 3  
Average Values and Range for Dependent Variable  
Return on Investment in percent (1995)  
(ROI)

| Industry<br>SIC | Low     | Mean   | High   |
|-----------------|---------|--------|--------|
| All<br>Firms    | -826.67 | -28.30 | 145.19 |
| 28              | -613.35 | -98.32 | 22.24  |
| 35              | -256.08 | -18.82 | 145.19 |
| 36              | -118.28 | .97    | 42.24  |
| 38              | -413.83 | -16.13 | 33.61  |
| 48              | -24.04  | -6.69  | 24.10  |
| 73              | -826.67 | -30.24 | 33.96  |

The market performance measure will be captured as the return in stock price from the close of the initial offer day price to the 1995 end of year price (**PRICE**). As indicated above, this measure is the single most widely used measure by financial analysts and investors, and ideally incorporates all public information available to investors in its changes. Stock price growth was selected as a performance measure because it represents

the view of analysts and investors of firm financial health (Welbourne, Meyer et al. 1998) and is the most used measure of firm performance in the IPO literature (Ibbotson and Ritter 1995). Summary statistics for the variable **PRICE** are shown in Table 4.

**Table 4**  
**Average Values and Range for Dependent Variable**  
**Price Return in percent (1992-1995)**

| (PRICE)         |         |       |        |
|-----------------|---------|-------|--------|
| Industry<br>SIC | Low     | Mean  | High   |
| All<br>Firms    | -98.57  | 20.00 | 391.34 |
| 28              | -87.10  | -.60  | 260.71 |
| 35              | -98.57  | 36.99 | 336.59 |
| 36              | -95.02  | 31.09 | 382.56 |
| 38              | -84.26  | .78   | 116.22 |
| 48              | -.75.80 | -2.03 | 89.06  |
| 73              | -94.31  | 36.19 | 391.34 |

The final performance measure—customer perception based—is captured as the percentage increase in sales from 1992 to the average of sales for fiscal year 1995 and 1996

(SALESG). Averaging the two years minimizes the potential for using a cyclical year as a variable and provides a better indicator of real sales growth. The measure is calculated as a return on 1992 year sales (average of 1995 and 1996 sales less 1992 sales, divided by 1992 sales). This allows true sales growth to be measured, rather than gross sales growth.

Cooperative agreements have been shown to increase sales and growth (Mitchell & Singh, 1996; Zimmerman 1999). Growth in sales is an outcome valued by both managers and investors. Managers seek growth because their power, prestige, and pay are closely tied to firm sales (Ciscel and Carroll, 1980; Finkelstein and Hambrick, 1988). Investors value strong sales growth, particularly in high-tech firms, because it signals technological strength and future earnings potential (Florida and Kenney, 1990). In an extremely competitive setting like the personal computer industry (Eisenhardt, 1989; Steffens, 1994), opportunities for growth without accompanying risks are likely to be few. Some stakeholders will take substantial risks in hopes of higher growth. Others will choose a safer course. Sales growth, used in the strategy literature to assess firm

performance (e.g., Fredrickson and Mitchell, 1984), is a particularly strong indicator, in this industry, of a firm's technological viability (Steffens, 1994).

Sales growth is one of the most used measures of performance in entrepreneurship studies (Murphy et al, 1993). Sales growth is necessary for funding of new ventures, and indicative of increasing customer acceptance of firm products (Robinson, 1998). Sales growth is believed to be the best measure of firm growth since it reflects both short and long-term changes in the firm (Hoy, McDougall et al. 1992), and is the most often used measure of growth by entrepreneurs themselves (Wiklund 1998). Summary statistics for the variable **SALESG** are shown in Table 5.

Table 5  
Average Values and Range for Dependent Variable  
Sales Growth in percent (1992-1996)  
(SALESG)

| Industry<br>SIC | Low    | Mean   | High    |
|-----------------|--------|--------|---------|
| All Firms       | -92.65 | 349.81 | 3514.17 |
| 28              | -83.82 | 335.10 | 1663.57 |
| 35              | -35.49 | 340.43 | 2059.68 |
| 36              | -54.55 | 266.13 | 1545.09 |
| 38              | -43.69 | 266.83 | 2107.41 |
| 48              | -9.48  | 322.41 | 1449.70 |
| 73              | -92.65 | 501.76 | 3514.17 |

#### Independent Variables

The independent variables consist of five proposed measures of firm legitimacy at the time of IPO: 1) The percentage of shares retained by original shareholders after the IPO, 2) The market to book ratio for the firm at the time of IPO, 3) The total value of the equity raised through the IPO, 4) the age of the firm, and 5) the size of the firm (see chapter II).

The first IV, shares retained (**SR**) is measured as a ratio variable from zero to one. Leland and Pyle's

(1977) seminal research found that original stockholders can signal the quality of their firm by the degree to which they are willing to retain shares in the firm at the time of IPO. The true value of the firm at the time of IPO is known only to the original owners or entrepreneurs. The entrepreneurs signal the inside information by their willingness to invest in their own firm. Those with relatively more faith in the firm invest relatively more than those with less faith. The entrepreneur retaining shares does so in the belief that over the long term the shares will be worth substantially more than the price the market assigns at the time of IPO.

The retaining of shares is expensive for the entrepreneur at the time of the IPO, because it requires the entrepreneur to diversify his portfolio to a lesser extent than might otherwise be done. Investors realize the cost associated with retaining shares, assign positive legitimacy value to the action, and are willing to pay more for the shares (Keloharju and Kulp, 1996). The act of retaining shares should also therefore serve as a signal of firm quality to others, such as potential cooperative agreement partners. Summary statistics for (SR) are shown in Table 6.

Table 6  
Average Values and Range for Independent Variable  
Shares Retained in percent at IPO  
(SR)

| Industry<br>SIC | Low  | Mean  | High  |
|-----------------|------|-------|-------|
| All<br>Firms    | 1.00 | 39.18 | 87.7  |
| 28              | 5.19 | 41.42 | 76.19 |
| 35              | 1.50 | 36.82 | 75.30 |
| 36              | 5.56 | 38.16 | 78.10 |
| 38              | 5.65 | 35.79 | 81.10 |
| 48              | 2.40 | 37.57 | 77.10 |
| 73              | 1.00 | 43.36 | 87.70 |

The second IV is Market-to-Book ratio (**MB**) at the time of the IPO. **MB** is measured as a ratio variable from zero to one. **MB** is a measure of firm legitimacy assigned by the investment community to a new issue. Public information is analyzed resulting in an opinion on the potential future earnings and growth of the firm. The difference between the total market value of the firm and the book value of the firm represents the premium

assigned by investors and analysts for the expected future performance of the firm based on current management, strategy, and firm capabilities. This ratio should also signal to potential collaborators the cooperative legitimacy of the firm. The summary of the actual and natural log data for (MB) is shown in Table 7 and 7a.

**Table 7**  
**Average Values and Range for Independent Variable**  
**Market-to-Book ratio at IPO**  
**(MB)**

| Industry<br>SIC | Low  | Mean | High  |
|-----------------|------|------|-------|
| All<br>Firms    | .00  | 3.90 | 83.97 |
| 28              | 1.53 | 3.35 | 5.05  |
| 35              | .00  | 3.08 | 7.10  |
| 36              | 1.55 | 5.11 | 83.97 |
| 38              | 1.17 | 3.37 | 11.31 |
| 48              | 1.05 | 4.47 | 23.54 |
| 73              | .83  | 3.94 | 10.77 |



Table 7a  
Average Values and Range for Independent Variable  
Market-to-Book ratio at IPO (natural log)  
(MB)

| Industry<br>SIC | Low  | Mean | High |
|-----------------|------|------|------|
| All Firms       | -.19 | 1.14 | 4.43 |
| 28              | .43  | 1.17 | 1.62 |
| 35              | .06  | 1.08 | 1.96 |
| 36              | .44  | 1.11 | 4.43 |
| 38              | .16  | 1.09 | 2.43 |
| 48              | .05  | 1.04 | 3.16 |
| 73              | -.19 | 1.26 | 2.38 |

The third IV, the total value of the IPO (**VAL**) is measured in millions of dollars. IPO value has been found to be a key measure of firm legitimacy (Deeds et al., 1997, 1999). Since the primary objective of going public is to gain access to resources, and investor resources are limited, higher quality firms are capable of securing more IPO dollars. The summary of the actual and natural log data for (**VAL**) is shown in Table 8 and 8a.

Table 8  
Average Values and Range for Independent Variable  
Total Value of IPO  
(VAL)

| Industry<br>SIC | Low  | Mean  | High   |
|-----------------|------|-------|--------|
| All Firms       | 3.90 | 34.21 | 640    |
| 28              | 5.00 | 32.73 | 187.20 |
| 35              | 4.00 | 30.56 | 165    |
| 36              | 4.50 | 27.45 | 117    |
| 38              | 4.20 | 22.88 | 123.40 |
| 48              | 7.00 | 93.21 | 640.00 |
| 73              | 3.90 | 22.41 | 90.20  |

Table 8a  
Average Values and Range for Independent Variable  
Total Value of IPO (natural log)  
(VAL)

| Industry<br>SIC | Low  | Mean | High |
|-----------------|------|------|------|
| All Firms       | 1.36 | 3.02 | 6.46 |
| 28              | 1.61 | 2.98 | 5.23 |
| 35              | 1.39 | 2.93 | 5.11 |
| 36              | 1.5  | 3.06 | 4.76 |
| 38              | 1.44 | 2.83 | 4.82 |
| 48              | 1.95 | 4.04 | 6.46 |
| 73              | 1.36 | 2.71 | 4.50 |

The final two IVs are the age of the firm at the time of the IPO (**AGE**), and the size of the firm (**SIZE**). The age of the firm is collected from the prospectus and company filings and is calculated from the founding of the firm to the time of the IPO in years. Firm size was collected from the prospectuses and firm filings and operationalized as the number of employees the firm had at the time of IPO. The use of employees as an indicator of firm size serves two purposes. First, cooperative

agreements require employee support, so it follows that firms with more employees will be better able to support cooperative agreements. Second, the use of employee measures as opposed to a financial measure such as total assets allows for better comparisons between industries in the sample. High tech or internet firms do not have the same asset capitalization that a heavy machinery or manufacturing firm might have.

According to liability of newness literature (Henderson, 1999; Hannan and Freeman, 1987) and liability of adolescence literature (Ingram, 1993), younger, smaller firms have more difficulty in securing necessary resources for the firm. These firms should also have more difficulty in entering into cooperative agreements. The summary of actual and natural log data for **(AGE)** is shown in Table 9 and 9a. The summary of the actual and natural log data for **(SIZE)** is shown in Table 10 and 10a.

Table 9  
Average Values and Range for Independent Variable  
Firm Age at IPO  
(AGE)

| Industry<br>SIC | Low  | Mean  | High  |
|-----------------|------|-------|-------|
| All<br>Firms    | 1.00 | 8.99  | 77.00 |
| 28              | 1.00 | 6.71  | 19.00 |
| 35              | 2.00 | 9.83  | 47.00 |
| 36              | 1.00 | 8.09  | 26.00 |
| 38              | 1.00 | 12.27 | 77.00 |
| 48              | 1.00 | 9.76  | 47.00 |
| 73              | 1.00 | 7.81  | 18.00 |

Table 9a  
Average Values and Range for Independent Variable  
Firm Age at IPO (natural log)  
(AGE)

| Industry<br>SIC | Low | Mean | High |
|-----------------|-----|------|------|
| All Firms       | .00 | 1.87 | 4.34 |
| 28              | .00 | 1.62 | 2.94 |
| 35              | .69 | 1.99 | 3.85 |
| 36              | .00 | 1.89 | 3.26 |
| 38              | .00 | 2.08 | 4.34 |
| 48              | .00 | 1.73 | 3.85 |
| 73              | .00 | 1.82 | 2.89 |

Table 10  
Average Values and Range for Independent Variable  
Number of Employees at IPO  
(SIZE)

| Industry<br>SIC | Low   | Mean    | High   |
|-----------------|-------|---------|--------|
| All Firms       | 1.00  | 1177.13 | 87,100 |
| 28              | 1.00  | 2018.86 | 40,000 |
| 35              | 11.00 | 519.65  | 4462   |
| 36              | 10.00 | 777.18  | 9305   |
| 38              | 4.00  | 359.46  | 4500   |
| 48              | 14.00 | 268.82  | 727    |
| 73              | 5.00  | 2680.92 | 87,100 |



Table 10a  
Average Values and Range for Independent Variable  
Number of Employees at IPO (natural log)  
(SIZE)

| Industry<br>SIC | Low  | Mean | High  |
|-----------------|------|------|-------|
| All<br>Firms    | .00  | 4.93 | 11.37 |
| 28              | .00  | 4.16 | 10.60 |
| 35              | 2.4  | 4.78 | 8.4   |
| 36              | 2.3  | 5.48 | 9.14  |
| 38              | 1.39 | 4.93 | 8.41  |
| 48              | 2.64 | 5.15 | 6.59  |
| 73              | 1.61 | 4.91 | 11.37 |

#### Control Variable

The control variable used is Industry (IN) Prior research suggests that there may be differences across industries (Barry et al 1990) in terms of the performance of IPO firms. The logic of such an argument certainly has face validity. Different industries, by definition, require different levels of capitalization, use different

technologies<sub>1</sub> and manufacture different products or services. Given this, it is realistic to expect variance in measures of firm performance including the number and type of cooperative agreements entered into. As the SIC codes themselves have no real value if used in a variable, contrast codes are developed instead to allow for focused comparisons between the industries.

### Mediating Variables

The proposed model presented in this dissertation indicates presumed mediating variables. The first presumed mediating variables is an increase in firm cooperative agreements from 1992 (pre-IPO) to 1994 (post-IPO) **(CAI)**. The second presumed mediating variable is an increase in firm quality cooperative agreements from 1992 (pre-IPO) to 1994 (post-IPO) **(QCAI)**.

A variable is a mediator to the extent that it accounts for the relationship between a predictor and a criterion variable (Baron and Kenny, 1986). In this dissertation, it is presumed that increases in quantity and quality of cooperative agreements mediates the relationship between the presumed firm legitimacy factors and the ultimate performance variables. To verify the mediating role of the presumed mediator variables, three conditions must be met. First, variations in the independent variable must significantly account for

variation in the presumed mediator. Second, variations in the presumed mediator must account significantly for variation in the dependent variable. Third, when the relationship between both the independent and mediator variables and the dependent variable simultaneously, a previously significant relationship between the independent and dependent variable must no longer be significant (Baron and Kenny, 1986). The conduct and results of these tests are discussed in the statistical analysis section of this chapter.

While the changes in number and quality of cooperative agreements are depicted as mediating variables in the proposed model, the variables also take on the role of dependent variables for the portion of the statistical analysis examining the predictive role of the independent variables on the ensuing changes in firm cooperative agreements.

Data for the two mediating variables was collected from the SDC Joint Venture database, a product of the Thompson Financial Group. The SDC Joint Venture database captures information on joint ventures, equity joint ventures; natural research exploration, funding agreements, royalty alliances, licensing agreements, exclusive licensing agreements, joint manufacturing operations, joint marketing operations, original equipment manufacturing/value added reseller agreements,

privatization government alliances, joint research & development, supply agreements, and firm spinouts. Each of the cooperative agreements listed above was enumerated as one cooperative agreement for the year the firm entered into the agreement. Cooperative agreement totals for 1994 were compared to cooperative agreement totals for 1992. If the firm experienced an increase in cooperative agreements, the variable was coded as 1. If the firm did not experience an increase in cooperative agreements, the variable was coded 0.

Quality of firm cooperative agreements was defined as those agreements the firm participated in with Fortune 500 firms. The CUSIPs of the partner firms in the sample was compared to a list of CUSIPs for Fortune 500 firms for the year of the agreement (1992 or 1994). Firms that experienced an increase in the number of quality cooperative agreements they entered were coded as 1. Firms that did not experience an increase in the number of quality cooperative agreements were coded as a 0. The summary of the actual data for (CAI) and (QCAI) is shown in Tables 11a and 11b respectively.

Table 11a  
 Distribution for Mediating Variable  
 Increase in Number of Cooperative Agreements  
 (CAI)

| Industry<br>SIC | Firms<br>Increased | Firms Did<br>Not Increase |
|-----------------|--------------------|---------------------------|
| All Firms       | .40                | .60                       |
| 28              | .63                | .37                       |
| 35              | .40                | .60                       |
| 36              | .45                | .55                       |
| 38              | .35                | .65                       |
| 48              | .20                | .80                       |
| 73              | .32                | .68                       |

Table 11b  
Distribution for Mediating Variable  
Increase in Number of Quality Cooperative Agreements  
(QCAI)

| Industry<br>SIC | Firms<br>Increased | Firms Did<br>Not Increase |
|-----------------|--------------------|---------------------------|
| All Firms       | .08                | .92                       |
| 28              | .06                | .94                       |
| 35              | .18                | .82                       |
| 36              | .05                | .95                       |
| 38              | .06                | .94                       |
| 48              | .00                | 1.00                      |
| 73              | .07                | .93                       |

#### STATISTICAL ANALYSIS

The first research issue, determining the appropriateness of compiling a legitimacy index score for IPO firms composed of the five proposed legitimacy variables is addressed via factor analysis. The first step in the factor analysis was an examination of the independent variables for normalcy. Four of the five

(MB, SIZE, VAL, and AGE) were severely skewed and required normalizing. The distribution for SR, while slightly skewed, was not improved through normalizing. As a result, original data is used for this variable.

A common correction for non-constant variance is the use of the natural logarithm of the variable. Natural logarithms are less variable than original values and often stabilize variance (Dielman, 1996). The skewness of the variables prior to and after the transformation of the variables is shown in Table 12. The natural logs of the original variables are indicated with the prefix "N.".

**Table 12**  
**Skewness of Independent Variables**  
**Pre and Post Transformation**

| Variable | Skewness | Standard<br>Deviation |
|----------|----------|-----------------------|
| MB       | 11.01    | 6.36                  |
| N.MB     | 1.80     | .53                   |
| SIZE     | 10.37    | 7385.31               |
| N.SIZE   | .593     | 1.64                  |
| VAL      | 7.39     | 55.66                 |
| N.VAL    | .345     | .95                   |
| AGE      | 4.06     | .93                   |
| N.AGE    | -.46     | .84                   |
| SR       | .07      | 20.98                 |

An exploratory factor analysis was conducted on the independent variables using the SPSS program. According to Sharma (1996), the first decision to be made in factor analysis is to determine whether or not the data is suitable for factor analysis. In order for variables to be grouped into homogenous sets, there must be high correlations between the variables. Low correlations indicate the variables do not have much in common or are heterogenous variables (Sharma, 1996). An examination of



the correlation matrix (Table 13) indicates that while there are significant correlations between **N.MB** and **N.SR** and between **N.SIZE** and **N.VAL**, and to a lesser degree between **SR** and **N.VAL**, there does not appear to be a strong correlation between the entire set of variables. Table 13 illustrates that while several of the correlations between the IVs are significant, none of them approach the  $R^2$  level of .90 (which is the recommended cut in several texts, (see: Tabachnik and Fidell, 1983; Neter, Wasserman, and Kutner, 1985). The relatively low correlations indicate that multicollinearity is not a problem. Further, while the initial examination of the correlation matrix does not indicate that the variables will load on a single factor, it does suggest that further investigation of the variables relative to their appropriateness for factoring is appropriate.

**Table 13**  
**Correlations of Independent Variables**

|                | SR              | N.MB           | N.AGE        | N.SIZE         | N.VAL |
|----------------|-----------------|----------------|--------------|----------------|-------|
| SR<br>Sig      | 1.00            |                |              |                |       |
| N.MB<br>Sig    | .241**<br>.001  | 1.00           |              |                |       |
| N.AGE<br>Sig.  | -.059<br>.472   | -.161*<br>.037 | 1.00         |                |       |
| N.SIZE<br>Sig. | -.133<br>.105   | .073<br>.353   | .147<br>.061 | 1.00           |       |
| N.VAL<br>Sig   | -.210**<br>.006 | .045<br>.537   | .071<br>.359 | .568**<br>.000 | 1.00  |

\* Correlation is significant at .05 level (2-tailed)

\*\* Correlation is significant at .01 level (2-tailed)

The Kaiser-Meyer-Olkin measure of sampling adequacy is a popular diagnostic measure used to assess the extent to which the measures of a construct belong together (Sharma, 1996). In this case, it measures the homogeneity of the independent variables. The result of this test was .494. Kaiser and Rice (1974) suggest that while measures of sampling adequacy between .50 and .60 are miserable, anything below .50 is unacceptable. While the result in this case appears to approximate the line

of acceptability, Sharma (1996) further suggests that only a measure above .60 is tolerable.

A Principal Component Analysis extracted a two component solution with eigenvalues over 1.00. This two factor solution accounted for 57.3% of the variance. It should be noted that a third component also was extracted with an eigenvalue of .995, certainly near enough to the heuristic 1.00 line of acceptance to indicate that a three factor solution (explaining 77.2% of the variance) may be more appropriate in this case. Recalling that the objective in this factor analysis was to search for a single factor of legitimacy, an analysis of the two primary factors was conducted. The two factor solution converged in three iterations utilizing Varimax rotation with Kaiser normalization. Factor 1 seems to be a resource legitimacy factor. IPO total value allows the firm to acquire other resources necessary to operate the firm. Employees are the instruments of innovation, and interface points for cooperative agreements. Both of these variables capture resources that are required to compete successfully and grow the firm. Factor 2 appears to be a risk assessment legitimacy component.

The second research issue is the appropriateness of **CAI** and **QCAI** as mediating variables in the proposed model. Barron and Kenny (1986) recommend a three step process in determining the appropriateness of mediator variable inclusion in variable relationship modeling. Each of these steps is discussed below.

First, variations in the levels of the independent variable must significantly account for variations in the presumed mediator. This relationship is tested by estimating the regression equation(s) resulting from regressing the mediator(s) on the independent variables. The first test was conducted by regressing an increase in cooperative agreements on the IVs.

$$CAI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \epsilon_i$$

The second equation to be tested regresses an increase in quality cooperative agreements on the IVs.

$$QCAI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \epsilon_i$$

In order to continue with testing for mediation, the independent variables must affect the mediator(s) in these equations.

The results of the first two regression equations support a potential mediating effect. Table 14 contains

the results of the regression of **CAI**, on the independent variables. Four of the five proposed legitimacy indicators have significant relationships with a firm's increase in cooperative agreements following the IPO. N.MB, N.AGE, and N.VAL are all significant at less than .05 using a one tail test. N.SIZE is also highly significant approaching .01 utilizing a two-tailed test. Two-tail test results are reported in this case since the relationship between firm size and increases in cooperative agreements are negative, which is opposite of the relationship hypothesized.

Table 14

## Increase in Cooperative Agreements Regression Model

| Dependent Variable: Increase in Cooperative Agreements (CAI) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Stand-<br>ardized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| (Constant)   | .0214                               | .233          | 1.00                              | .092   | .927                   |
| Sic 28   | .347                                | .136          | .232                              | 2.555  | .012                   |
| Sic 35   | .0946                               | .117          | .075                              | .811   | .419                   |
| Sic 36   | .0981                               | .117          | .08                               | .84    | .403                   |
| Sic 38   | .079                                | .127          | .056                              | .621   | .536                   |
| Sic 48   | -.394                               | .217          | -.16                              | -1.818 | .071                   |
| SR   | .0003                               | .002          | .013                              | .154   | .878                   |
| N.MB   | .174                                | .086          | .173                              | 2.027  | .045 $\psi^*$          |
| N.AGE  | .104                                | .056          | .152                              | 1.858  | .065 $\psi$            |
| N.SIZE   | -.0834                              | .034          | -.247                             | -2.478 | .014*                  |
| N.VAL  | .111                                | .056          | .191                              | 1.966  | .051 $\psi$            |

| R    | R-Square | Adjusted<br>R Square | Std<br>Error of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .416 | .173     | .111                 | .469                        | 142 | 2.766 |

\* Significant at  $p < .05$  level (2-tailed) $\psi$  Significant at  $p < .05$  level (1-tailed)

The results of the equation regressing an increase in firm quality cooperative agreements indicate support for a significant relationship between all of the previously significant independent variables with the exception of **N.MB**. **N.AGE** nears significance at  $p < .056$  (one tailed). The results are shown in Table 15.

Table 15

## Increase in Quality Cooperative Agreements Regression

## Model

| Dependent Variable: Increase in Quality Cooperative Agreements (QCAI) |  |               |  |        |                        |
|---|--|---------------|--|--------|------------------------|
|   | Unstan-<br>dardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B  | Std.<br>Error | Beta                                   |        |                        |
| (Constant)  | -.156                                    | .141          | 1.00                                   | -1.104 | .272                   |
| Sic 28  | -.0472                                   | .082          | -.054                                  | -.573  | .568                   |
| Sic 35  | .113                                     | .071          | .153                                   | 1.594  | .113                   |
| Sic 36  | -.003                                    | .071          | -.004                                  | -.043  | .966                   |
| Sic 38  | .0183                                    | .077          | .023                                   | .237   | .813                   |
| Sic 48  | -.156                                    | .131          | -.109                                  | -1.188 | .237                   |
| SR  | -.000019                                 | .001          | -.001                                  | -.015  | .988                   |
| N.MB  | .0404                                    | .052          | .069                                   | .778   | .438                   |
| N.AGE   | .0542                                    | .034          | .137                                   | 1.605  | .111                   |
| N.SIZE  | -.0379                                   | .020          | -.193                                  | -1.857 | .065 $\psi$            |
| N.VAL   | .0917                                    | .034          | .272                                   | 2.681  | .008**                 |

| R    | R-Square | Adjusted<br>R Square | Std<br>Error of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .312 | .097     | .029                 | .2843                       | 142 | 1.424 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

$\psi$  Significant at  $p < .05$  level (1-tailed)



The results of the first two regression equations indicate support for a mediating role of the two proposed mediating variables. Step two of Barron and Kenny's (1986) test examines the relationship between the dependent variable and the independent variables. In order to support a mediating effect, the independent variables must significantly effect the ultimate dependent variables in the model. This step requires three regression equations, one for each of the performance variables **SALESG**, **PRICE** and **ROI**.

The first equation regresses sales growth on the independent variables.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \varepsilon_i$$

The results of this equation are presented in Table 16. This equation supports a potential mediating role between the age of the firm at IPO and sales growth post-IPO.

Table 16

## Sales Growth Regression Model

| Dependent Variable: Change in Sales (SALESG) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| (Constant)                                   | 991.441                             | 273.141       | 1.00                              | 3.630  | .000                   |
| Sic 28                                       | -237.503                            | 158.242       | -.148                             | -1.501 | .136                   |
| Sic 35                                       | -102.046                            | 129.624       | -.081                             | -.787  | .433                   |
| Sic 36                                       | -182.445                            | 132.578       | -.146                             | -1.376 | .172                   |
| Sic 38                                       | -261.445                            | 145.629       | -.177                             | -1.795 | .075                   |
| Sic 48                                       | -30.232                             | 301.710       | -.009                             | -.100  | .920                   |
| SR   | 3.010                               | 2.398         | .114                              | 1.255  | .212                   |
| N.MB   | 97.017                              | 95.588        | .093                              | 1.015  | .312                   |
| N.AGE  | -208.663                            | 68.233        | -.273                             | -3.058 | .003**                 |
| N.SIZE                                       | -24.634                             | 37.862        | -.070                             | -.651  | .517                   |
| N.VAL  | -72.370                             | 66.273        | -.115                             | -1.092 | .277                   |

| R    | R-Square | Adjusted<br>R Square | Std<br>Error of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .448 | .201     | .127                 | 484.524                     | 118 | 2.714 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The next equation regresses change in stock price on the independent variables.

$$PRICE_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i \\ + \beta_4 N.VAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \varepsilon_i$$

The results of this equation are presented in Table 17. This equation indicates no support for a potential mediating role between the independent variables and stock price return post-IPO.

Table 17

## Price Return Regression Model

| Dependent Variable: Return on Stock Price from IPO to CY95 YE<br>(PRICE) |  |               |  |       |                        |
|--|--|---------------|--|-------|------------------------|
|  | Unstand-<br>ardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T     | Sig.<br>(2-<br>tailed) |
| Model  | B  | Std.<br>Error | Beta                                   |       |                        |
| (Constant)   | 35.249                                   | 55.301        | 1.00                                   | .639  | .524                   |
| Sic 28   | -15.220                                  | 31.494        | -.053                                  | -.483 | .630                   |
| Sic 35   | 21.123                                   | 26.106        | .090                                   | .809  | .420                   |
| Sic 36   | -4.357                                   | 25.231        | -.020                                  | -.173 | .863                   |
| Sic 38   | -12.957                                  | 27.162        | -.053                                  | -.477 | .634                   |
| Sic 48   | -18.008                                  | 44.279        | -.044                                  | -.407 | .685                   |
| SR   | .352                                     | .447          | .081                                   | .787  | .433                   |
| N.MB   | -8.755                                   | 19.160        | -.048                                  | -.457 | .649                   |
| N.AGE  | -6.527                                   | 12.409        | -.052                                  | -.526 | .600                   |
| N.SIZE   | 2.077                                    | 7.630         | .032                                   | .272  | .786                   |
| N.VAL  | -3.929                                   | 13.407        | -.033                                  | -.293 | .770                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .175 | .031     | -.059                | 92.1362                     | 118 | .340 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The final equation in step two regresses change in return on investment on the independent variables.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i \\ + \beta_4 NVAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \epsilon_i$$

The results of this equation are presented in Table 18. This equation indicates significant support for a potential mediating role between firm size at IPO and firm ROI post-IPO.

Table 18

## Return on Investment Regression Model

| Dependent Variable: Return on Invest for FY 95 (ROI) |  |               |  |        |                        |
|--|--|---------------|--|--------|------------------------|
|  | Unstand-<br>ardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B  | Std.<br>Error | Beta                                   |        |                        |
| (Constant)   | -152.514                                 | 53.062        | 1.00                                   | -2.874 | .005                   |
| Sic 28   | -63.548                                  | 30.774        | -.191                                  | -2.065 | .041                   |
| Sic 35   | 24.336                                   | 25.914        | .088                                   | .939   | .349                   |
| Sic 36   | 27.116                                   | 26.580        | .099                                   | 1.020  | .310                   |
| Sic 38   | 35.726                                   | 28.190        | .118                                   | 1.267  | .207                   |
| Sic 48   | 22.515                                   | 48.378        | .042                                   | .465   | .642                   |
| SR   | .172                                     | .468          | .032                                   | .369   | .713                   |
| N.MB   | 14.287                                   | 23.151        | .053                                   | .617   | .538                   |
| N.AGE  | -7.123                                   | 12.372        | -.048                                  | -.576  | .566                   |
| N.SIZE   | 16.559                                   | 7.634         | .215                                   | 2.169  | .032*                  |
| N.VAL  | 9.922                                    | 12.824        | .077                                   | .774   | .441                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .421 | .177     | .112                 | 103.191                     | 137 | 2.732 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The results of the second series of equations indicate there are several possible paths between the

independent and dependent variables in which a mediation effect may be present.

The third step in the Barron and Kenny (1986) mediating variable test is to regress the dependent variable on both the independent and the mediating variable simultaneously. This requires a total of six equations, two (CAI and QCAI) for each of the dependent variables (SALESG, PRICE, ROI). To finally verify the mediating function of an increase in firm cooperative agreements and/or an increase in firm quality cooperative agreements A mediation effect is present if the relationship between the independent variable(s) and the dependent variable(s) is reduced in the final equations, while the effect of the mediating variable on the dependent variable remains significant. Barron and Kenny (1986:1177) wrote that perfect mediation has occurred when "the independent variable has no effect when the mediator is controlled." They go on to caveat the goal for perfection as most areas of research investigate variables with multiple causes:

" . . . a more realistic goal may be to seek mediators that significantly decrease [the path between independent and dependent variables] rather than eliminating the relation between the independent and dependent

variables altogether. From a theoretical perspective, a significant reduction demonstrates that a given mediator is indeed potent, albeit not both a necessary and sufficient condition for the effect to occur." (Barron and Kenny, 1986:1176)

The first set of equations in this final step will test the performance variable sales growth, first with the mediator **CAI**, then with the mediator **QCAI**.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 N.VAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 CAI_i + \varepsilon_i$$

The results of this equation are shown in Table 19. The results support no mediation effect for the model presented in the equation. The highly significant negative relationship between firm age and post-IPO sales remains significant at  $p < .01$ .



Table 19

## Sales Growth Regression Model (SALESG)

| Dependent Variable: Change in Sales from IPO to post-IPO.<br>(SALESG) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| (Constant)  | 990.245                             | 272.970       | 1.00                              | 3.628  | .000                   |
| Sic 28  | -205.480                            | 160.970       | -.128                             | -1.277 | .205                   |
| Sic 35  | -88.564                             | 130.158       | -.070                             | -.680  | .498                   |
| Sic 36  | -161.502                            | 133.943       | -.129                             | -1.206 | .231                   |
| Sic 38  | -252.389                            | 145.785       | -.171                             | -1.731 | .086                   |
| Sic 48  | -74.372                             | 304.348       | -.023                             | -.244  | .807                   |
| SR  | 3.175                               | 2.402         | .120                              | 1.322  | .189                   |
| N.MB  | 116.129                             | 97.195        | .112                              | 1.195  | .235                   |
| N.AGE   | -194.963                            | 69.390        | -.255                             | -2.810 | .006**                 |
| N.SIZE  | -.35.292                            | 39.137        | -.100                             | -.902  | .369                   |
| N.VAL   | -.62.021                            | 66.939        | -.099                             | -.927  | .356                   |
| CAI   | -104.806                            | 98.308        | -.100                             | -1.066 | .289                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .457 | .209     | .128                 | 484.2188                    | 118 | 2.574 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The next equation regresses SALESG on the QCAI mediator and the independent variables.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 N.VAL_i \\ + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 QCAI_i + \varepsilon_i$$

The results of this equation are shown in Table 20. The results support no mediation effect for the model presented in the equation. As was the case with increasing firm cooperative agreement overall, the highly significant negative relationship between firm age and post-IPO sales remains significant at  $p < .01$ .

Table 20

## Sales Growth Regression Model (SALESG)

| Dependent Variable: Change in Sales from IPO to post-IPO.<br>(SALESG) |  |               |  |        |                        |
|---|--|---------------|--|--------|------------------------|
|   | Unstand-<br>ardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B  | Std.<br>Error | Beta                                   |        |                        |
| (Constant)  | 979.693                                  | 276.289       | 1.00                                   | 3.546  | .001                   |
| Sic 28  | -239.725                                 | 159.014       | -.150                                  | -1.508 | .135                   |
| Sic 35  | -93.834                                  | 132.237       | -.074                                  | -.710  | .480                   |
| Sic 36  | -.182.041                                | 133.124       | -.146                                  | -1.367 | .174                   |
| Sic 38  | -262.160                                 | 146.238       | -.178                                  | -1.793 | .076                   |
| Sic 48  | -40.031                                  | 304.224       | -.012                                  | -.132  | .896                   |
| SR  | 3.057                                    | 2.412         | .115                                   | 1.268  | .208                   |
| N.MB  | 100.585                                  | 96.515        | .097                                   | 1.042  | .300                   |
| N.AGE   | -206.407                                 | 68.812        | -.270                                  | -3.000 | .003**                 |
| N.SIZE  | -27.391                                  | 38.818        | -.078                                  | -.706  | .482                   |
| N.VAL   | -65.962                                  | 69.001        | -.105                                  | -.956  | .341                   |
| QCAI  | -57.843                                  | 164.710       | -.032                                  | -.351  | .726                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .449 | .202     | .120                 | 486.503                     | 118 | 2.458 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The next equation regresses **PRICE** on the **CAI** mediator and the independent variables.

$$\begin{aligned} PRICE_i = & \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i \\ & + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 CAI_i + \varepsilon_i \end{aligned}$$

The results of this equation are shown in Table 21. The results support no mediation effect for the model presented in the equation. The results for this regression provide no support for a mediating role for an increase in firm cooperative agreements in the relationship between the independent variables and post IPO change in stock price.

Table 21

## Stock Price Regression Model (PRICE)

| Dependent Variable: Return on Stock Price from IPO to CY95 YE<br>(PRICE) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant   | 39.844                              | 55.264        | 1.00                              | .721   | .472                   |
| Sic 28   | -7.241                              | 32.037        | -.025                             | -.226  | .822                   |
| Sic 35   | 20.623                              | 26.038        | .088                              | .792   | .430                   |
| Sic 36   | -1.957                              | 25.234        | -.009                             | -.078  | .938                   |
| Sic 38   | -11.914                             | 27.100        | -.049                             | -.440  | .661                   |
| Sic 48   | -28.436                             | 44.923        | -.070                             | -.633  | .528                   |
| SR   | .349                                | .446          | .080                              | .783   | .436                   |
| N.MB   | -4.683                              | 19.378        | -.026                             | -.242  | .810                   |
| N.AGE  | -4.574                              | 12.471        | -.037                             | -.367  | .715                   |
| N.SIZE   | -.214                               | 7.822         | -.003                             | -.027  | .978                   |
| N.VAL  | -1.295                              | 13.531        | -.011                             | -.096  | .924                   |
| CAI  | -23.745                             | 18.799        | -.132                             | -1.263 | .209                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .212 | .045     | -.053                | 91.8833                     | 118 | .456 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The next equation regresses **PRICE** on the **QCAI** mediator and the independent variables.

$$\begin{aligned} PRICE_i = & \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i \\ & + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 QCAI_i + \varepsilon_i \end{aligned}$$

The results of this equation are shown in Table 22. The results support no mediation effect for the model presented in the equation. The results for this regression provide no support for a mediating role for an increase in firm quality cooperative agreements in the relationship between the independent variables and post IPO change in stock price.

Table 22

## Stock Price Regression Model (PRICE)

| Dependent Variable: Return on Stock Price from IPO to CY95 YE (PRICE) |                                     |               |                                   |       |                        |
|---|-------------------------------------|---------------|-----------------------------------|-------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T     | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |       |                        |
| Constant  | 35.930                              | 59.135        | 1.00                              | .608  | .545                   |
| Sic 28  | -11.360                             | 35.094        | -.040                             | -.324 | .747                   |
| Sic 35  | 22.622                              | 28.209        | .097                              | .802  | .424                   |
| Sic 38  | -8.410                              | 28.427        | -.035                             | -.296 | .768                   |
| Sic 48  | -9.260                              | 44.466        | -.023                             | -.208 | .835                   |
| Sic 73  | 3.512                               | 25.316        | .018                              | .139  | .890                   |
| SR  | .372                                | .449          | .085                              | .828  | .410                   |
| N.MB  | -8.618                              | 19.205        | -.047                             | -.449 | .655                   |
| N.AGE   | -7.360                              | 12.491        | -.059                             | -.589 | .557                   |
| N.SIZE  | 2.684                               | 7.694         | .041                              | .349  | .728                   |
| N.VAL   | -6.806                              | 14.024        | -.058                             | -.485 | .628                   |
| QCAI  | 22.439                              | 31.324        | .073                              | .716  | .475                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .188 | .035     | -.064                | 92.3446                     | 118 | .355 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The final pair of equations examines the potential mediating effect between the independent variables and the performance variable **ROI**. The next equation regresses **ROI** on the **CAI** mediator and the independent variables.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i \\ + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 CAI_i + \varepsilon_i$$

The results of this equation are shown in Table 23. The results for this regression provide support for a mediating role for an increase in firm cooperative agreements in the relationship between the firm age and post IPO ROI.



Table 23

## Return on Investment Regression Model (ROI)

| Dependent Variable: Return on Investment FY 95 (ROI) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstan-<br>dardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant   | -147.968                            | 52.336        | 1.00                              | -2.827 | .005                   |
| Sic 28   | -47.226                             | 31.239        | -.142                             | -1.512 | .133                   |
| Sic 35   | 28.099                              | 25.598        | .102                              | 1.098  | .274                   |
| Sic 36   | 30.951                              | 26.255        | .113                              | 1.179  | .241                   |
| Sic 38   | 38.853                              | 27.819        | .128                              | 1.397  | .165                   |
| Sic 48   | 5.433                               | 48.318        | .010                              | .112   | .911                   |
| SR   | .212                                | .461          | .039                              | .459   | .647                   |
| N.MB   | 18.569                              | 22.900        | .069                              | .811   | .419                   |
| N.AGE  | -2.198                              | 12.400        | -.015                             | -.177  | .860                   |
| N.SIZE   | 12.872                              | 7.711         | .167                              | 1.669  | .098 $\psi$            |
| N.VAL  | 14.126                              | 12.785        | .110                              | 1.105  | .271                   |
| CAI  | -42.175                             | 19.340        | -.192                             | -2.181 | .031*                  |

| R     | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|-------|----------|----------------------|-----------------------------|-----|------|
| ..455 | .207     | .138                 | 101.6987                    | 137 | 2.99 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

$\psi$  Significant at  $p < .05$  level (1-tailed)

The next equation in the mediation test series regresses ROI on the QCAI mediator and the independent variables.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 N.VAL_i \\ + \beta_5 N.SIZE_i + \beta_6 SR_i + \beta_7 QCAI_i + \varepsilon_i$$

The results of this equation are shown in Table 24. The results support no mediation effect for the model presented in the equation. The significant relationship between firm size and ROI remains when an increase in firm quality cooperative agreements is controlled for.

Table 24

## Return on Investment Regression Model (ROI)

| Dependent Variable: Return on Investment FY 95 (ROI) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant   | -151.444                            | 53.517        | 1.00                              | -2.830 | .005                   |
| Sic 28   | -63.218                             | 30.932        | -.190                             | -2.044 | .043                   |
| Sic 35   | 23.613                              | 26.250        | .086                              | .900   | .370                   |
| Sic 36   | 27.145                              | 26.681        | .099                              | 1.017  | .311                   |
| Sic 38   | 35.618                              | 28.302        | .117                              | 1.258  | .211                   |
| Sic 48   | 23.525                              | 48.810        | .044                              | .482   | .631                   |
| SR   | .173                                | .469          | .032                              | .368   | .714                   |
| N.MB   | 13.958                              | 23.294        | .052                              | .599   | .550                   |
| N.AGE  | -7.466                              | 12.530        | -.050                             | -.596  | .552                   |
| N.SIZE   | 16.805                              | 7.756         | .218                              | 2.167  | .032*                  |
| N.VAL  | 9.321                               | 13.202        | .072                              | .706   | .481                   |
| QCAI   | 6.524                               | 31.743        | .017                              | .206   | .838                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .421 | .177     | .106                 | 103.5828                    | 137 | 2.99 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

Although an independent test of the effect the mediator variables have on the dependent variables is not specifically called for, it is useful in order to compare changes in the effects measured directly against the effect measured when using the mediator variable as a control (Barron and Kenny, 1986). In this case, it is not necessary to test direct effects of a change in quality cooperative agreements since there was no significant relationship between **QCAI** and any dependent variables in the previous regression equations. However, regression equations must be calculated for the direct impact of **CAI** to determine changes that occur when the affect the variable has when included in the regression equation with the independent variables. The results first of first of these three equations are shown in Table 25. The first regression shows no significant relationship between an increase in firm cooperative agreements and sales growth post-IPO.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 CAI_i + \varepsilon_i$$

Table 25

## Sales Growth Regression Model (SALESG)

| Dependent Variable: Change in Sales (SALESG) |                                     |               |                                   |       |                        |
|--|-------------------------------------|---------------|-----------------------------------|-------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T     | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |       |                        |
| Constant                                     | 325.894                             | 93.038        | 1.00                              | 3.503 | .001                   |
| CAI  | 10.277                              | 81.508        | .010                              | .126  | .900                   |
| Sic 28                                       | 2.948                               | 137.543       | .002                              | .021  | .983                   |
| Sic 36                                       | -67.912                             | 123.692       | -.054                             | -.549 | .584                   |
| Sic 38                                       | -62.357                             | 133.514       | -.044                             | -.467 | .641                   |
| Sic 48                                       | 29.286                              | 190.299       | .013                              | .154  | .878                   |
| Sic 73                                       | 151.623                             | 115.265       | .133                              | 1.315 | .190                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .169 | .029     | -.007                | 505.9733                    | 168 | .792 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The second regression shows no significant relationship between an increase in firm cooperative agreements and sales growth post-IPO. The results are shown in Table 26.

$$PRICE_i = \beta_0 + \beta_1 IND_i + \beta_2 CAI_i + \varepsilon_i$$

Table 26

## Stock Price Return Regression Model (PRICE)

| Dependent Variable: Change in Stock Price from IPO to CY 95 YE<br>(PRICE) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant  | 26.164                              | 13.621        | 1.00                              | 1.921  | .057                   |
| CAI   | -15.119                             | 14.810        | -.083                             | -1.021 | .309                   |
| Sic 28  | -19.663                             | 25.503        | -.075                             | -.771  | .442                   |
| Sic 35  | 12.281                              | 23.868        | .051                              | .515   | .608                   |
| Sic 38  | -28.212                             | 24.125        | -.115                             | -1.169 | .244                   |
| Sic 48  | -33.246                             | 28.776        | -.107                             | -1.155 | .250                   |
| Sic 73  | .01378                              | 21.197        | .000                              | .001   | .999                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .188 | .035     | -.001                | 89.9064                     | 164 | .963 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

The final regression shows that there is a significant (one-tailed) negative relationship between an increase in firm cooperative agreements and return on investment. The results are shown in Table 27.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 CAI_i + \varepsilon_i$$

Table 27

## ROI Regression Model (ROI)

| Dependent Variable: Return on Investment Post-IPO FY 95 (ROI) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant  | -18.516                             | 14.516        | 1.00                              | -1.276 | .204                   |
| CAI   | -27.661                             | 14.849        | -.133                             | -1.863 | .064                   |
| Sic 28  | -62.963                             | 23.366        | -.217                             | -2.695 | .008                   |
| Sic 35  | 10.783                              | 21.073        | .042                              | .512   | .609                   |
| Sic 36  | 31.145                              | 21.818        | .115                              | 1.428  | .155                   |
| Sic 38  | 11.921                              | 22.688        | .042                              | .525   | .600                   |
| Sic 48  | 14.755                              | 28.864        | .039                              | .511   | .610                   |

| R    | R-Square | Adjusted<br>R Square | Std<br>Error of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .328 | .108     | .079                 | 97.8926                     | 193 | 3.764 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

Table 28 summarizes the results of the series of regression equations required to determine which if any of the relationships are mediated by variables in the proposed model.

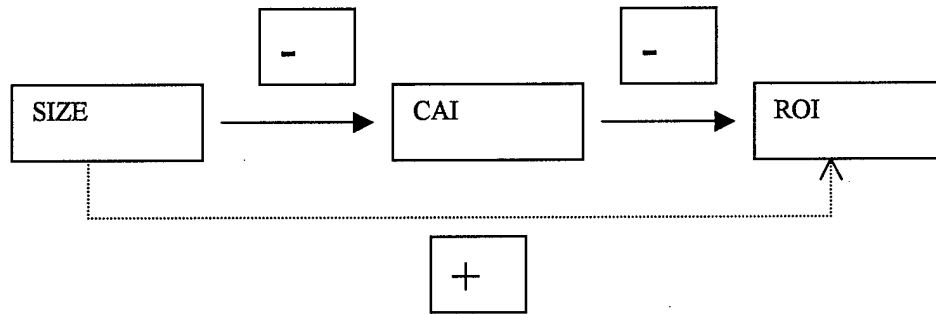
Table 28  
Summary of Mediation Variable Tests

| Required Tests   | DV in Test | Variables<br>Passing<br>Test                              | Effect |
|--|------------|---|--------|
| IV must have sig<br>effect on<br>mediators   | CAI        | N.AGE   | +      |
|  |            | N.MB  | +      |
|  |            | N.SIZE  | -      |
|  |            | N.VAL   | +      |
|  | QCAI       | N.AGE   | +      |
|  |            | N.SIZE  | +      |
|  |            | N.VAL   | +      |
|  |            |   |        |
| IV must have sig<br>effect on DV   | ROI        | N.SIZE  | +      |
|  | SALESG     | N.AGE   | -      |
| When DV is<br>regressed on IV<br>and MV<br>simultaneously, MV<br>must be<br>significant, and<br>IV effect must be<br>reduced | ROI        | N.SIZE<br>Becomes<br>less sig (<br>p=.098 vs.<br>.032/ -) | +      |
|  |            | CAI<br>Becomes<br>more sig<br>(p = .031<br>vs. .064)      | -      |

The tests of mediation indicate that the depiction of increases in cooperative agreements as mediating variables are inappropriate in all but one



case. Based on the sample under consideration and the data for each variable considered, an accurate model of the mediation effect on the appropriate variables is shown below.



An increase in firm cooperative agreements mediates the effect of firm size on firm ROI post-IPO. In fact the mediation changes the relationship from a positive one to a negative one. These results will be discussed further in chapter VI. The failure of the proposed mediating variable to prove to have a mediating effect on more of the proposed independent variables requires that proposed hypotheses be tested utilizing two models. The adjusted models and the tests of the hypotheses will be presented in the next chapter.

## **CHAPTER V**

### **RESULTS**

#### **INTRODUCTION**

This chapter begins with adjustments to the model hypotheses developed in the previous chapters. The chapter then discusses the statistical tests used to examine each hypothesis and systematically reports the findings for each hypothesis.

As was discussed in the previous chapter, two findings in this study require a modification of the conceptual model and hypotheses. First, construction of a single legitimacy index from the proposed five legitimacy indicators is not appropriate and second, there is no general mediation role for increases in cooperative agreements in the legitimacy-performance relationship.

Because a legitimacy index could not be developed, each legitimacy indicator was tested for a relationship with changes in quality (**QCAI**) and quantity of cooperative (**CAI**) agreements. In separate regression equations, the relationship between changes in cooperative agreements and performance were tested. In

other words, rather than a single model with an IV (legitimacy), mediating variables (QCAI and CAI), and performance DVs, two models are tested as shown in Figure 5. Each hypothesis developed in chapter three is expanded to reflect required testing of the individual relationships between the variables. In order to reduce confusion, the tested hypotheses are numbered as indicated in Figure 5.

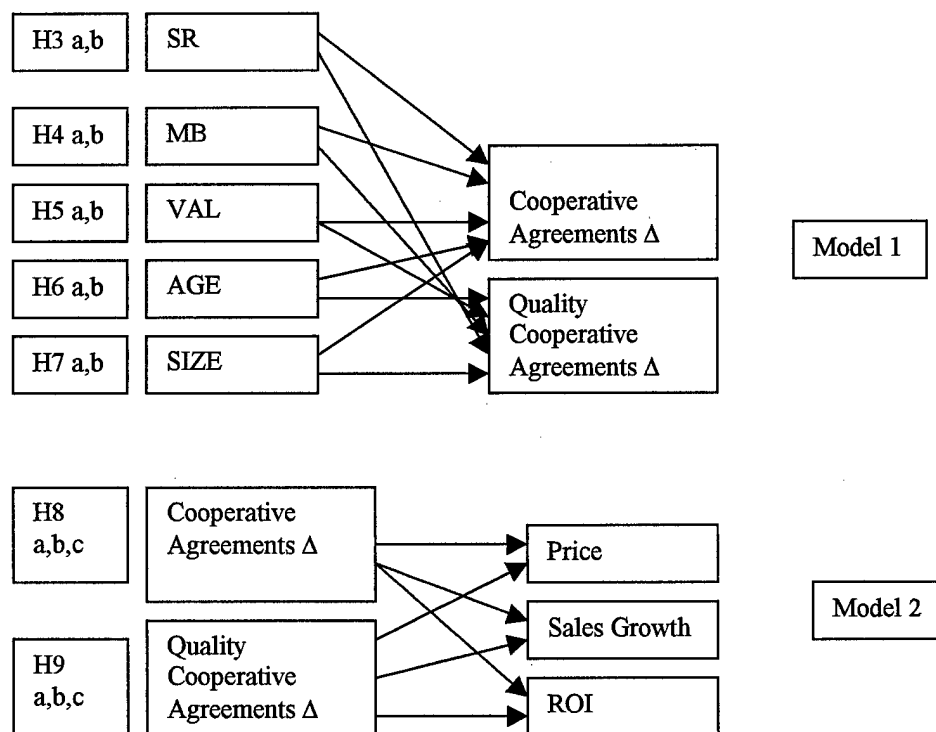


Figure 5

The results received by testing each of these models are presented in the following sections.

Model One Findings—Relationships Between Legitimacy Indicators and Increases in Cooperative Agreements

The first set of hypotheses tested in model one were those regressing an increase in cooperative agreements on the legitimacy factors at the time of IPO.

H3a: The percentage of shares retained by management at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

H4a: The market-to-book ratio at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

H5a: The total value of the IPO will be positively related to an increase in cooperative agreements post-IPO.

H6a: The age of the firm at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

H7a: The number of employees at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

These hypotheses were tested using the following regression equation:

$$CAI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i \\ + \beta_4 N.VAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \varepsilon_i$$

The results of the regression are presented in Table 29.

**H3a:** The percentage of shares retained by management at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

**NOT SUPPORTED**

The use of retained ownership as a signal of firm quality at the time of IPO is widely supported in the finance literature. Contrary to expectations, there was no significant relationship found between percentage of shares retained (**SR**) and subsequent increases in cooperative agreements (**CAI**). In fact, the percentage of shares retained by the firm explain less about increases in cooperative agreements than any other variable tested, including industry effects for each of the SIC code groups examined.

**H4a:** The market-to-book ratio at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

**SUPPORTED**

As expected, the normalized market-to-book ratio of the firm at the time of IPO (N.MB) was found to have a significant, positive relationship with a subsequent increase in cooperative agreements (CAI).

H5a: The total value of the IPO will be positively related to an increase in cooperative agreements post-IPO.

#### SUPPORTED

The results of the regression equation indicate support for a positive relationship between firm value at IPO (N.VAL) and subsequent increases in cooperative agreements (CAI). While the two-tailed significance of this relationship nears significance ( $p < .052$ ), the one-tailed significance easily reaches a significant level ( $p < .026$ ).

Table 29  
Increase in Cooperative Agreements Regression  
(Model 1)

| Dependent Variable: Increase in Cooperative Agreements (CAI) |  |               |  |        |                        |
|--|--|---------------|--|--------|------------------------|
|  | Unstand-<br>ardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B  | Std.<br>Error | Beta                                   |        |                        |
| Constant   | .0214                                    | .233          | 1.00                                   | .092   | .927                   |
| Sic 28   | .347                                     | .136          | .232                                   | 2.555  | .012                   |
| Sic 35   | .0946                                    | .117          | .075                                   | .811   | .419                   |
| Sic 36   | .0981                                    | .117          | .08                                    | .84    | .403                   |
| Sic 38   | .079                                     | .127          | .056                                   | .621   | .536                   |
| Sic 48   | -.394                                    | .217          | -.16                                   | -1.818 | .071                   |
| SR   | .0003                                    | .002          | .013                                   | .154   | .878                   |
| N.MB   | .174                                     | .086          | .173                                   | 2.027  | .045*                  |
| N.AGE  | .104                                     | .056          | .152                                   | 1.858  | .065ψ                  |
| N.SIZE   | -.0834                                   | .034          | -.247                                  | -2.478 | .014*                  |
| N.VAL  | .111                                     | .056          | .191                                   | 1.966  | .051ψ                  |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .416 | .173     | .111                 | .469                        | 142 | 2.766 |

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

H6a: The age of the firm at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

#### SUPPORTED

The relationship between normalized firm age at IPO (N.AGE) and an increase in cooperative agreements (CAI) is also supported. While the significance results for a two-tailed test approach significance ( $p < .066$ ), these results can be interpreted as significant one-tailed findings ( $p < .033$ ).

H7a: The number of employees at the time of IPO will be positively related to an increase in cooperative agreements post-IPO.

#### NOT SUPPORTED

The number of employees at the time of IPO (N.SIZE) was not found to be positively related to an increase in cooperative agreements (CAI). In fact, in direct opposition to my hypothesis, there is a highly significant ( $p < .014$ , two-tailed) **negative** effect of employee size on subsequent cooperative agreements.

The results of the regression of changes in cooperative agreements on the proposed legitimacy factors indicates that four of the five variables do predict a subsequent change in the number of firm cooperative



agreements. The implications of these findings will be discussed in chapter VI.

Model One Findings—Relationships Between Legitimacy Indicators and Increases in Quality Cooperative Agreements

The second set of hypotheses tested in model one were those regressing an increase in quality cooperative agreements on the legitimacy factors at the time of IPO.

H3b: The percentage of shares retained by management at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

H4b: The market-to-book ratio at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

H5b: The total value of the IPO will be positively related to an increase in quality cooperative agreements post-IPO.

H6b: The age of the firm at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

H7b: The number of employees at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

These hypotheses were tested using the following regression equation:

$$QCAI_i = \beta_0 + \beta_1 IND_i + \beta_2 N.AGE_i + \beta_3 NMB_i + \beta_4 NVAL_i + \beta_5 N.SIZE_i + \beta_6 SR_i + \varepsilon_i$$

The results from this regression equation are presented in Table 30.

Table 30

## Increase in Quality Cooperative Agreements

## Regression (Model 1)

| Dependent Variable: Increase in Quality Cooperative Agreements (QCAI) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant  | -.156                               | .141          | 1.00                              | -1.104 | .272                   |
| Sic 28  | -.0472                              | .082          | -.054                             | -.573  | .568                   |
| Sic 35  | .113                                | .071          | .153                              | 1.594  | .113                   |
| Sic 36  | -.003                               | .071          | -.004                             | -.043  | .966                   |
| Sic 38  | .0183                               | .077          | .023                              | .237   | .813                   |
| Sic 48  | -.156                               | .131          | -.109                             | -1.188 | .237                   |
| SR  | -.000019                            | .001          | -.001                             | -.015  | .988                   |
| N.MB  | .0404                               | .052          | .069                              | .778   | .438                   |
| N.AGE   | .0542                               | .034          | .137                              | 1.605  | .111                   |
| N.SIZE  | -.0379                              | .020          | -.193                             | -1.857 | .065                   |
| N.VAL   | .0917                               | .034          | .272                              | 2.681  | .008**                 |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .312 | .097     | .029                 | .2843                       | 142 | 1.424 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

**H3b: The percentage of shares retained by management at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.**

**NOT SUPPORTED**

As was the case with the hypothesized relationship between retained shares and the quantity of cooperative agreements in H3a, no significant relationship was detected. In fact, the relationship tested was once again found to show the weakest significance of all variables tested in the equation, including all industry effects.

**H4b: The market-to-book ratio at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.**

**NOT SUPPORTED**

Contrary to expectations, no significant relationship was found between normalized firm market-to-book ratios (**N.MB**) at IPO and subsequent increases in quality cooperative agreements (**QCAI**).

**H5b: The total value of the IPO will be positively related to an increase in quality cooperative agreements post-IPO.**

**SUPPORTED**

As predicted, there is a highly significant, positive relationship between the total value of the firm

IPO (N.VAL) and subsequent increases in quality cooperative agreements (QCAI). This effect was found to be of the highest significance of the relationships tested ( $p < .009$ , two tailed).

H6b: The age of the firm at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

NOT SUPPORTED

The positive relationship found between firm age (N.AGE) at IPO and increases in quality cooperative agreements (QCAI) was not found to be significant. However, this relationship does approach significance ( $p < .056$ , one-tailed) and may prove to be significant given a more statistically powerful test.

H7b: The number of employees at the time of IPO will be positively related to an increase in quality cooperative agreements post-IPO.

NOT SUPPORTED

The relationship between firm size and quality cooperative agreements was found to be negative. This finding is contrary to the hypothesis. That notwithstanding, the negative effect approaches two-tailed significance ( $p < .066$ ) and will be discussed

further with the other findings from this model in Chapter 6.

The significant findings resulting from Model 1 testing are summarized in Table 31.

**Table 31**  
**Summary of Model 1 Significant Findings**

| <i>Hypothesis</i> |                 |                     | <b>A</b>    | <b>B</b>    |
|-------------------|-----------------|---------------------|-------------|-------------|
|                   |                 |                     | <b>CAI</b>  | <b>QCAI</b> |
|                   | <b>Variable</b> | <b>Relationship</b> | <u>Sig.</u> | <u>Sig.</u> |
| <b>H3</b>         | SR              |                     | NS          | NS          |
| <b>H4</b>         | N.MB            | +                   | .045        | NS          |
| <b>H5</b>         | N.AGE           | +                   | .033 (1)    | NS          |
| <b>H6</b>         | N.SIZE          | -                   | .014        | NS          |
| <b>H7</b>         | N.VAL           | +                   | .026 (1)    | .008        |

(1) One-tailed significance

Model Two Findings—Relationships Between Changes in Cooperative Agreements and Performance

The first set of hypotheses tested in model two were those regressing performance dependent variables on an increase in cooperative agreements.

H8a: An increase in cooperative agreements post-IPO will be positively related to an increase in stock price post-IPO.

NOT SUPPORTED

Contrary to expectations, an increase in cooperative agreements post-IPO had no significant relationship with firm stock price post-IPO. The results of the regression equation below are presented in Table 32.

$$PRICE_i = \beta_0 + \beta_1 IND_i + \beta_2 QCAI_i + \varepsilon_i$$

Table 32

## Stock Price Return Regression Model (PRICE)

| Dependent Variable: Change in Stock Price from IPO to CY 95 YE<br>(PRICE) |  |               |  |        |                        |
|---|--|---------------|--|--------|------------------------|
|   | Unstand-<br>ardized<br>Coeffic-<br>ients |               | Standard-<br>ized<br>Coeffic-<br>ients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B  | Std.<br>Error | Beta                                   |        |                        |
| Constant  | 26.164                                   | 13.621        | 1.00                                   | 1.921  | .057                   |
| CAI   | -15.119                                  | 14.810        | -.083                                  | -1.021 | .309                   |
| Sic 28  | -19.663                                  | 25.503        | -.075                                  | -.771  | .442                   |
| Sic 35  | 12.281                                   | 23.868        | .051                                   | .515   | .608                   |
| Sic 38  | -28.212                                  | 24.125        | -.115                                  | -1.169 | .244                   |
| Sic 48  | -33.246                                  | 28.776        | -.107                                  | -1.155 | .250                   |
| Sic 73  | .01378                                   | 21.197        | .000                                   | .001   | .999                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .188 | .035     | -.001                | 89.9064                     | 164 | .963 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

H8b: An increase in cooperative agreements post-IPO will be positively related to an increase in sales post-IPO.

NOT SUPPORTED



There was no significant relationship detected between changes in cooperative agreements post-IPO and sales growth from pre to post-IPO. The results of the regression equation below are presented in Table 33.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 CAI_i + \epsilon_i$$

**Table 33**  
**Sales Growth Regression Model (SALESG)**

| Dependent Variable: Change in Sales (SALESG) |                                     |               |                                   |       |                        |
|--|-------------------------------------|---------------|-----------------------------------|-------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T     | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |       |                        |
| Constant                                     | 325.894                             | 93.038        | 1.00                              | 3.503 | .001                   |
| CAI  | 10.277                              | 81.508        | .010                              | .126  | .900                   |
| Sic 28                                       | 2.948                               | 137.543       | .002                              | .021  | .983                   |
| Sic 36                                       | -67.912                             | 123.692       | -.054                             | -.549 | .584                   |
| Sic 38                                       | -62.357                             | 133.514       | -.044                             | -.467 | .641                   |
| Sic 48                                       | 29.286                              | 190.299       | .013                              | .154  | .878                   |
| Sic 73                                       | 151.623                             | 115.265       | .133                              | 1.315 | .190                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .169 | .029     | -.007                | 505.9733                    | 168 | .792 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

H8c: An increase in cooperative agreements post-IPO will be positively related to an increase in return on investment post-IPO.

NOT SUPPORTED

Contrary to the relationship hypothesized, a positive relationship between increased cooperative agreements and firm return on investment was not found. In fact, a negative relationship approaching significance was found ( $p < .065$ ). The results from the regression equation below are presented in Table 34.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 CAI_i + \varepsilon_i$$

Table 34

## ROI Regression Model (ROI)

| Dependent Variable: Return on Investment Post-IPO FY 95 (ROI) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant  | -18.516                             | 14.516        | 1.00                              | -1.276 | .204                   |
| CAI   | -27.661                             | 14.849        | -.133                             | -1.863 | .064                   |
| Sic 28  | -62.963                             | 23.366        | -.217                             | -2.695 | .008                   |
| Sic 35  | 10.783                              | 21.073        | .042                              | .512   | .609                   |
| Sic 36  | 31.145                              | 21.818        | .115                              | 1.428  | .155                   |
| Sic 38  | 11.921                              | 22.688        | .042                              | .525   | .600                   |
| Sic 48  | 14.755                              | 28.864        | .039                              | .511   | .610                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .328 | .108     | .079                 | 97.8926                     | 193 | 3.764 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

Model Two Findings—Relationships Between Changes in  
Quality Cooperative Agreements and Performance

The second set of hypotheses investigated in model two relate to the relationship between changes in quality

cooperative agreements entered into post-IPO and subsequent changes in firm performance.

**H9a: An increase in quality cooperative agreements post-IPO will be positively related to an increase in stock price post-IPO.**

**NOT SUPPORTED**

Contrary to expectations, there is no significant relationship between changes in quality cooperative agreements post-IPO and subsequent changes in firm stock price. The results of the regression equation below are presented in Table 35.

$$PRICE_i = \beta_0 + \beta_1 IND_i + \beta_2 QCAI_i + \varepsilon_i$$

Table 35

## Stock Price Return Regression Model (PRICE)

| Dependent Variable: Change in Stock Price from IPO to CY 95 YE (PRICE) |                                     |               |                                   |        |                        |
|--|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant   | 26.152                              | 16.525        |                                   | 1.583  | .116                   |
| QCAI   | 22.788                              | 26.536        | .069                              | .859   | .392                   |
| Sic 28   | -22.937                             | 25.266        | -.087                             | -.908  | .365                   |
| Sic 35   | 10.532                              | 24.079        | .043                              | .437   | .662                   |
| Sic 38   | -26.251                             | 24.125        | -.107                             | -1.088 | .278                   |
| Sic 48   | -27.191                             | 28.513        | -.087                             | -.954  | .342                   |
| Sic 73   | .01135                              | 21.22         | .000                              | .001   | 1.000                  |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .183 | .033     | -.003                | 89.9926                     | 164 | .911 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

H9b: An increase in quality cooperative agreements post-IPO will be positively related to an increase in sales post-IPO.

NOT SUPPORTED

No significant relationship was found between changes in quality cooperative agreements post-IPO and

sales growth post-IPO. The results of the regression equation below are presented in Table 36.

$$SALESG_i = \beta_0 + \beta_1 IND_i + \beta_2 QCAI_i + \varepsilon_i$$

**Table 36**  
**Sales Growth Regression Model (SALESG)**

| Dependent Variable: Change in Sales (SALESG) |                                     |               |                                   |       |                        |
|--|-------------------------------------|---------------|-----------------------------------|-------|------------------------|
|  | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T     | Sig.<br>(2-<br>tailed) |
| Model  | B                                   | Std.<br>Error | Beta                              |       |                        |
| Constant                                     | 327.470                             | 91.776        |                                   | 3.568 | .000                   |
| QCAI   | 12.897                              | 145.136       | .007                              | .089  | .929                   |
| Sic 28                                       | 7.066                               | 138.625       | .005                              | .051  | .959                   |
| Sic 36                                       | -65.599                             | 125.431       | -.052                             | -.523 | .602                   |
| Sic 38                                       | -61.160                             | 135.464       | -.043                             | -.451 | .652                   |
| Sic 48                                       | 29.993                              | 192.015       | .013                              | .156  | .876                   |
| Sic 73                                       | 152.384                             | 116.738       | .134                              | 1.305 | .194                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F    |
|------|----------|----------------------|-----------------------------|-----|------|
| .169 | .028     | -.008                | 505.9858                    | 168 | .791 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

**H9c: An increase in quality cooperative agreements post-IPO will be positively related to an increase in return on investment post-IPO.**

**NOT SUPPORTED**

The hypothesized positive relationship was not detected. Significant industry effects were detected for SIC 28. The results for the regression equation below are presented in Table 37.

$$ROI_i = \beta_0 + \beta_1 IND_i + \beta_2 QCAI_i + \varepsilon_i$$

**Table 37**

**ROI Regression Model (ROI)**

| Dependent Variable: Return on Investment Post-IPO FY 95 (ROI) |                                     |               |                                   |        |                        |
|---|-------------------------------------|---------------|-----------------------------------|--------|------------------------|
|   | Unstand-<br>ardized<br>Coefficients |               | Standard-<br>ized<br>Coefficients | T      | Sig.<br>(2-<br>tailed) |
| Model   | B                                   | Std.<br>Error | Beta                              |        |                        |
| Constant  | -21.115                             | 16.981        |                                   | -1.243 | .215                   |
| QCAI  | 11.458                              | 26.323        | .031                              | .435   | .664                   |
| Sic 28  | -78.555                             | 25.062        | -.271                             | -3.134 | .002                   |
| Sic 36  | 21.315                              | 23.885        | .079                              | .892   | .373                   |
| Sic 38  | 4.191                               | 24.694        | .015                              | .170   | .865                   |
| Sic 48  | 13.666                              | 30.633        | .036                              | .446   | .656                   |
| Sic 73  | -7.858                              | 21.443        | -.034                             | -.366  | .714                   |

| R    | R-Square | Adjusted<br>R Square | Std Error<br>of<br>Estimate | df  | F     |
|------|----------|----------------------|-----------------------------|-----|-------|
| .304 | .092     | .063                 | 98.7467                     | 193 | 3.162 |

\*\* Significant at  $p < .01$  (2 tailed)

\* Significant at  $p < .05$  level (2-tailed)

ψ Significant at  $p < .05$  level (1-tailed)

In summary, none of the hypothesized relationships between increases in quantity or quality of cooperative agreements post-IPO and subsequent firm performance were supported. To the contrary, the only significant relationship was a negative relationship between increased cooperative agreements and firm return on investment.

The implications of the results from both models are discussed further in Chapter VI.



## CHAPTER VI

### DISCUSSION AND FUTURE RESEARCH

#### INTRODUCTION

The use of cooperative agreements continues to increase and their utilization remains an important option in maintaining or improving the competitive position of the firm. Because of the important role played by these inter-firm relationships, management scholars are focusing increased attention on the factors leading to the formation of these agreements, and to their impact on firm performance. Using perspectives of organizational legitimacy and resource-based theory, this dissertation empirically examined the relationships between firm legitimacy, increases in quality and quantity of cooperative agreements, and subsequent changes in firm performance. This chapter reviews the primary findings of the dissertation.

The findings support central tenants of organizational legitimacy theory. Increased firm legitimacy at the time of IPO is related to increases in quantity and quality of firm cooperative agreements in the year following the IPO. The results demonstrate that

there are legitimacy indicators within the control of the firm that may be utilized to signal the quality of the firm to potential cooperative partners. Firm managers may chose to enact the environment to maximize these indicators and others evaluations of the firm's level of legitimacy.

With regard to the relationship between increases in cooperative agreements and firm performance, the findings are less encouraging. The results of this investigation found no significant positive relationship between increases in inter-firm relationships and firm performance subsequent to those increases. To the contrary, the empirical evidence indicates that there is a significant *negative* relationship between the use of cooperative agreements and one financial measure of performance. So while increased firm legitimacy may lead to increased opportunities for forming cooperative agreements, the pursuit of those agreements may lead, at least in the near term, to decreased firm performance.

The final section of this chapter makes recommendations for future research studies. The importance of extending the longitudinal nature of the study is discussed, as well as examining the impact of

various time horizons in measuring firm performance. The potential amplification of firm legitimacy factors for non-U.S. firms conducting IPOs in U.S. markets is introduced. The final suggestion for future research is the investigation of a potential recursive relationship in legitimacy of IPO firms, cooperative agreements and firm performance.

#### LEGITIMACY OF IPO FIRMS

The main purpose of this dissertation was to determine whether proposed factors of firm legitimacy impacted the quality and quantity of firm cooperative agreements following the IPO. The legitimacy of IPO firms prior to the IPO has been examined [e.g. Deeds, 1997], but researchers have rarely examined the impact of firm legitimacy post-IPO, and have not investigated the impact of firm legitimacy on cooperative agreements. This study extends research from the fields of organization theory, strategic management and entrepreneurship in examining these relationships. An initial and important contribution this study makes is

that factors of firm legitimacy at the time of IPO do convey information to potential collaborators that may result in increased levels of firm cooperative agreements. Further, the evaluation of IPO firm characteristics does not end with the issue of shares of stock. The information signaled during the IPO evaluation process is also used by potential collaborators in selecting partners after the firms complete their IPOs. Firms should be aware that legitimacy signals transmitted during the pre-IPO phase transcend the IPO and have a continuing impact on the evaluation of the firm.

#### Signals of Firm Legitimacy and Cooperative Agreements

Three of the five hypothesized measures of firm legitimacy were found to have significant positive relationships with increases in cooperative agreements. A fourth measure had a negative relationship approaching significance, and the fifth measure had no significant relationship. Each of these results and their practical implication will be discussed in this section.

The three indicators that were found to have significant positive effects on increased levels of

cooperative agreements are market-to-book ratio, total value of the IPO offering, and firm age. These indicators were selected because they represent differing dimensions of firm legitimacy. Market-to-book ratio is a signal that the firm has relatively little control over. It is an evaluation of those in financial markets as to the premium that should be ascribed to a firm. In this regard it is an estimation of the potential future value of the firm. This judgment is based in part on firm capabilities and the likelihood that those capabilities will be successfully employed to create future firm value. In the IPO scenario, the financial markets evaluate firm capabilities and award the most promising firms with higher premiums and thus higher market-to-book ratios. Market-to-book in turn acts as a signal to prospective collaborators as to the potential of the firm.

There are two primary factors affecting the market-to-book ratio—the market value of firm stock (assigned by the financial markets) and the book value of the firm. The first is an unbiased assessment of the firm, and the second is difficult for the firm to manipulate, especially given the rigorous auditing during the IPO

period. The resulting measure of the firm—unbiased and difficult to distort, serves as a strong indicator of firm legitimacy, and in this study, a strong predictor of firm cooperative agreements.

While market-to-book may be the factor over which firms have the least control, they have only marginally greater control over the total value of the IPO. Total value is often used as the ultimate dependent variable in the study of IPO firm legitimacy. The more legitimate the firm—the greater the total value of the offering. Again, there are two primary aspects of this factor. First there is the number of shares offered by the firm, and second the price determined to be fair by the financial marketplace. To some degree, the owners of the firm have some control over the number of shares offered. But this number is often driven by other factors, such as the amount of funding required to make the offering worthwhile, and the funds necessary to pay off venture capital backing, which may be driving the IPO in the first place. The underwriter also affects the number of shares by assigning a prospective offering price to the issue. Total value of the IPO as a legitimacy indicator is maximized when the market responds to the offering by

driving up the initial offering price to extremely high levels. While similar to market-to-book in that the financial community is the primary evaluator, the standardizing aspect of firm book value is not included. Highly capitalized manufacturing firms are not necessarily rewarded with high market-to-book ratios that may be enjoyed by less capitalized firms such as Internet firms. As a result, both measures are appropriate indicators of legitimacy, and indicators of subsequent increases in cooperative agreements.

Entrepreneurs interested in enacting the environment in hopes of increasing cooperative agreements find their best opportunity in firm age. As predicted, the older the firm, the more likely the firm is to experience an increase in cooperative agreements. Older firms are more of a known quantity to potential collaborators. They are less susceptible to the liability of newness, and more likely to survive to see a cooperative agreement completed. The implication for firms considering an IPO are clear--wait as long as possible. Of course waiting may not be an option given pressures of VCs to harvest their investments and firm requirements for financial resources. Notwithstanding these concerns, and all other

things being equal, if a fundamental concern of the firm is pursuing increased cooperative agreements, delaying the IPO as long as possible should be considered.

The fourth indicator of legitimacy, firm size, did not have a positive relationship as predicted. Instead, firm size, indicated by the number of employees, had a negative relationship with increases in cooperative agreements. I hypothesized that firms with greater human resources would be seen as more likely to successfully attain the goals of a cooperative agreement. The finding that the number of employees at IPO is negatively related to future cooperative agreements is important because employees require the investment of considerable financial and managerial resources of the firm considering an IPO. This investment does not appear to be rewarded with future cooperative agreements. In fact, having employees that managers will naturally try to keep busy and productive within the firm, may lower the firm's propensity to seek cooperative agreements thus limiting the benefits of these cooperative relationships.

This finding also may be as a result of larger firms attempting to take advantage of smaller firms. Miles et al. (1999) found that smaller firms that relied



extensively on cooperative agreements were often unable to capture their share of gains from a cooperative relationship with larger firms. It follows that the larger firm then reaps the preponderance of the benefit from the collaboration. It may be that larger firms may find smaller 'novice' firms with desirable competencies to be more attractive partners.

The final measure of legitimacy, the percentage of shares retained by firm owners did not have a significant relationship with cooperative agreements. This finding was initially quite puzzling, given that the use of this measure as a signal of firm quality has been verified by a great deal of extant research. Further review has presented a potential explanation. Recent research indicates that use of retained shares may be losing its value as a signal of firm legitimacy (Courteau, 1995; Keloharju, 1996). Recall that the rationale for the use of this measure as a signal is that entrepreneurs who believe that the future value of firm shares widely exceeds the value that is immediately available through an IPO will retain as many shares as possible to maximize future wealth. The potential difficulty in using this measure as a signal resides in the degree of control the

entrepreneur has in the signal. Where the previous signals I discussed in this chapter limited firm control to some degree, there is almost no limit on the percentage of shares retained other than those mandated by the listing exchange and the SEC. Given the opportunity to manipulate this signal, entrepreneurs in marginal firms may chose to retain a greater percentage of shares than they otherwise might in an attempt to boost the evaluation of the firm (through increased IPO total value, increased stock price etc.). The robustness of retention of shares is thus diminished by the amount of influence a firm has over the signal.

Researchers have found that a potential modification to the shares retained factor may restore some degree of power to the signal (Courteau, 1995; Keloharju, 1996). Specifically, by examining not only the number of shares retained, but also the length of time owners 'lock up' or promise not to sell the shares after the IPO, a better assessment of firm quality can be made. An extension of the logic above indicates that while retaining shares is a costly signal, if the value resulting from the signal (in this case, higher share prices) more than offsets the cost, then entrepreneurs will choose to retain shares at

IPO, but sell them quickly to take advantage of the inflated value. By including the length of time of the lock up, evaluators can gain a better indication of firm legitimacy.

#### Signals of Firm Legitimacy and Quality Cooperative Agreements

It must be said at the outset of this section that the findings related to 'quality' cooperative agreements are driven by the definition of quality used in this study. The definition of what is a quality cooperative agreement is probably better assigned by firms on an individual basis. What is the very best possible cooperative agreement for one firm may not be the best possible for another firm. Notwithstanding that, I hypothesized that for the preponderance of firms in this study, being selected by a large firm with an abundance of resources and the luxury of being highly selective in the partner selection process would serve to set firms apart from one another. With this in mind, Fortune 500 firms were designated as 'quality' partners. The research question investigated was whether or not the indicators of firm legitimacy that predicted increases in cooperative agreements would further predict an increase

in cooperative agreements with Fortune 500 or quality firms.

One of the legitimacy indicators was found to have the hypothesized relationship with increases in quality cooperative agreements, another approached the significant level hypothesized, and a third approached significance, yet with a negative relationship. Given the relatively small number of firms that participated in quality cooperative agreements as defined in this study, it seems likely that the results of a study with a larger sample may find higher levels of significance. With that in mind, results found to approach significance in this dissertation are also discussed.

The total value of the IPO had a highly significant relationship with an increase in quality cooperative agreements. No other variable investigated caught the eye of Fortune 500 firms like the capital raised at IPO. IPO value conveys not only the evaluation of the financial market and investors, but also affords the firm the slack resources necessary to pursue cooperative agreements.

The age of the firm also seems to be an important indicator of firm legitimacy for Fortune 500 firms. A

positive relationship approaching significance exists between, firm age and quality agreements. As was the case with increases in cooperative agreements in general discussed above, firms that delay the IPO as long as possible seem to benefit with increases in cooperative agreements overall, and with exceptionally large firms as well.

As was the case with the first set of hypotheses, the relationship between firm size and increases in quality cooperative agreements is also negative (at a nearly significant level). Again, smaller firms are seen as more attractive partners. As discussed above, this could result from larger firms attempting to take advantage of smaller firms. Lacking a large team to participate in the collaboration, the larger firm may seek to overwhelm the smaller IPO firm and take advantage of the opportunity to exploit firm capabilities.

In summary, the findings suggest that three indicators of firm legitimacy lead to cooperative agreements post-IPO. Firms prefer to partner with older, smaller firms that were able to raise a relatively high level of financial resources at IPO. These firms have remained small for a long period of time and posses

competencies that are deemed highly valuable by financial markets. By partnering with these firms, large organizations may be able to evaluate them as potential future acquisitions. The least expensive method for acquiring access to a resource may be through a cooperative agreement with these firms. If the resource is not attained to the level desired, and if the partnering experience indicates a good fit between firms, the resource may be gained by acquiring the firm. In the case of an acquisition, the importance of the size of the firm becomes clear. The costs associated with acquiring and incorporating another firm are reduced in relation to the size of the firm acquired.

#### COOPERATIVE AGREEMENTS AND PERFORMANCE

The measurements of firm performance were carefully selected to reflect differing perspectives of performance. Those who believe a firm's primary obligation is maximizing shareholder wealth may be primarily interested in the use of change in stock price as a percentage of offer price. Entrepreneurs who believe that growing sales is the indication of firm

success may pay particular attention to that measure. Chief executives who have felt the pressure of performing to quarterly financial standards will perhaps be most interested in firm ROI as a measure of performance. There may not be a single best measure of performance, which is one of the reasons I chose to use the three indicators above.

Performance then is a matter of perception. Having attempted to gather performance measures from the various perceptions above, the impact of the findings are even more impressive. None of the hypothesized relationships between increases in quality and quantity of cooperative agreements and subsequent firm performance were supported. In fact, the only significant finding was a negative effect of increases in cooperative agreements on firm return on investment.

Perhaps the key point to consider in reviewing these findings is the time horizon used for performance measures. The sample firms all conducted IPOs in 1993. The changes in the number of cooperative agreements were measured from 1992 to 1994. The impact of those changes was then compared to measures of firm performance from 1992 to the year after the cooperative agreements, 1995

for stock price and ROI, and for the average of 1995/1996 for sales growth.

The lack of support for the hypotheses may be due to the time horizons employed. Consider first the impact of cooperative agreements on stock price. If the market values the cooperative agreement, one would expect an immediate positive reaction to the announcement reflecting the premium the market placed on the potential of the agreement. But as the impact of that piece of news fades and is overcome by subsequent quarterly earnings announcements and market conditions, the value of the cooperative agreement must affect financial performance to then effect stock price. A potential limitation of the study is that one year to eighteen months may be too short (or too long) a time horizon for utilizing stock price as a performance indicator.

Time horizon limitations may also exist for the use of sales growth. Perhaps eighteen months is too short a period of time to accurately reflect the impact of cooperative agreements on sales. Depending on the nature of the agreement, it may take longer than a year to incorporate the results of the cooperative agreement in products, and additional time to market and sell the



items. But recall that some of the cooperative agreements in this study had much shorter lead times. Marketing agreements, licensing agreements, and distribution agreements take much less time to impact sales than joint ventures and research and development agreements do.

Finally there is ROI. This measure has the least uncertainty of any of the three utilized in the study related to the impact of cooperative agreements. The commitment of resources to a cooperative agreements shows up very quickly in financial statements. Human resources committed to the project are no longer contributing to the bottom line in the manner they were previously. Financial resources committed are accounted for as expenses. The immediate impact is clear. And as the findings of this study indicate, the immediate impact is negative. The only significant relationship detected in the six hypotheses tested in this study is the negative relationship between increases in cooperative agreements and firm ROI. The implication for managers is also significant: the time horizon for reaping the rewards of cooperative agreements may be far off, but the cost is not. Managers whose performance is evaluated based on

short-term financials should be made aware that the decision to pursue cooperative agreements may provide long-term benefit to the firm, but it will not benefit short term financial performance measures.

## FUTURE RESEARCH DIRECTIONS

### Longitudinal Studies

Despite numerous attempts, scholars have failed to identify a positive relationship between the use of cooperative agreements and firm performance (Dodgson, 1992; Smith et al., 1995; Singh, 1997). The lack of support for an empirical link between cooperative agreements and performance may be due to the time horizon identified, or to the focus of researchers on corporate level performance, which may be too broad to capture the impact of cooperation.

The continued study of this cohort will provide important empirical evidence on the evolution of IPO firms, their utilization of cooperative agreements, and the subsequent impact on firm performance and firm legitimacy. As the firms in this study are monitored, a

significant relationship between previous increases in cooperative agreements and firm performance may emerge.

Future studies should also examine if there is a 'best' time to conduct the IPO, and if there is more benefit to pursuing cooperative agreements earlier in the IPO life cycle or later.

#### Foreign Firms

In the new digital economy continues to go global, national barriers are disappearing. Firms are no longer limited in their options for labor, resource and capital markets. As a result, a substantial number of the firms conducting IPOs in U.S. markets are non-U.S. firms.

Foreign firms choosing to pursue IPOs in the U.S. face even higher process costs than U.S. firms experience in executing an IPO due to physical separation from the potential investors during the road show phase. Additional costs may be incurred due to unfamiliarity with the marketplace and capital acquisition variance by country. Yet despite these additional concerns, foreign firms elect to secure capital in the U.S. Future research should seek to answer the question "Why"?

Given the findings on the importance of firm legitimacy in this study, is the pursuit of legitimacy even more important for those foreign firms, and is it more difficult to attain? Do foreign firms secure superordinate legitimacy through the IPO process itself? Do superordinate legitimacy levels accrue to foreign firms through the IPO process; a process whereby U.S. firms experience only conforming legitimacy? Follow-up research should also seek to determine whether the legitimacy indicators from this study hold for foreign firms as well.

#### Inter-organizational Form

Heppard (1998) found that organizational strategy varied relative to inter-organizational form utilized or available to a firm. My study investigated macro level increases in cooperative agreements. The different types of cooperation pursued by the firms in the sample I examined provide a fertile opportunity for more micro level analysis of the effect of differing inter-organizational forms in different industries. More effective forms of cooperation for firms of different age and size may also emerge.

Future research should investigate whether specific types of agreements have different impacts on firm performance, and whether different indicators of legitimacy lead to different types of agreements.

#### Recursive Nature of Legitimacy

Finally, as is discussed in this dissertation, some hold that there is no difference between indicators of legitimacy and legitimacy itself. I posit that the relationship is not tautological, but rather recursive. In other words, that legitimacy indicators lead to increased cooperative agreements which in turn leads to increased legitimacy.

Future research should investigate whether such a circle of legitimation exists for IPO firms. Are there identifiable characteristics that set the circle of legitimacy in motion for IPO firms? If the relationship is found to be recursive, that is legitimacy leads to increased cooperation which leads to increased legitimacy, what event takes place to break the cycle of increasing legitimacy. An investigation of cooperation failures or predatory practices of cooperation partners

may identify significant activities that break the cycle of legitimacy building.

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